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CHANGES IN THE VERBAL INTERACTION PATTERNS OF SECONDARY SCIENCE STUDENT TEACHERS WHO HAVE HAD TRAINING IN INTERACTION ANALYSIS AND THE RELATIONSHIP OF THESE CHANGES TO THE VERBAL INTERACTION OF THEIR COOPERATING TEACHERS. FINAL REPORT. SUMMARY REPORT.

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DESCRIPTORS- BEHAVIOR CHANGE, BIBLIOGRAPHES, CHANGE AGENTS, CLASSROOMS, COOPERATING TEACHERS, EDUCATIONAL CHANGE, EDUCATIONAL EXPERIMENTS, *INTERACTION PROCESS ANALYSIS, LESSON OBSERVATION CRITERIA, LITERATURE REVIEWS, SCIENCE TEACHERS, SECONDARY SCHOOL TEACHERS, STUDENT TEACHERS, TEACHING, TABLES (DATA), VERBAL LEARNING, FLANDERS,

THE PRIMARY OBJECTIVES OF THIS STUDY WERE--(1) TO IDENTIFY NON-RANDOM CHANGE IN THE VERBAL PATTERNS OF STUDENT TEACHERS OF SECONDARY SCIENCE WHO WERE TRAINED IN THE FLANDERS SYSTEM OF INTERACTION ANALYSIS, (2) TO RELATE THESE CHANGES TO THE VERBAL PATTERNS EXHIBITED BY THE COOPERATING TEACHERS INVOLVED, AND (3) TO COMPARE THE RESULTS WITH THOSE OF A CONTROL GROUP WHO WERE NOT SO TRAINED. THE STUDENT TEACHERS IN THE EXPERIMENTAL AND CONTROL GROUPS WERE OBSERVED FOR A TOTAL OF SIX CLASS HOURS--TWICE NEAR THE BEGINNING (PHASE ONE), TWICE NEAR THE MIDDLE (PHASE TWO), AND TWICE NEAR THE END (PHASE THREE) OF THE STUDENT TEACHING EXPERIENCE. SIX CLASS HOURS OF THEIR COOPERATING TEACHERS' VERBAL INTERACTION WERE ALSO OBTAINED. THE OBSERVATIONS WERE ALL CODED USING THE FLANDERS TECHNIQUE, AND ANALYZED IN ACCORDANCE WITH THE STATED OBJECTIVES. IT WAS FOUND THAT STUDENT TEACHERS WHO RECEIVED TRAINING IN INTERACTION ANALYSIS WERE MORE LIKELY TO EXPERIENCE NON-RANDOM CHANGES IN VERBAL PATTERNS THAN THOSE NOT SO TRAINED. THESE CHANGES WERE GENERALLY TOWARD MORE INDIRECT TEACHING INFLUENCE. IT WAS ALSO FOUND THAT THE EXPERIMENTAL GROUP WAS MORE LIKELY TO CHANGE IN RELATION TO THEIR COOPERATING TEACHERS THAN WAS THE CONTROL GROUP. IF EXPERIMENTATION IN THE CLASSROOM AND A GREATER SENSITIVITY TO THE TEACHING PATTERNS OF OTHERS ARE GOALS OF TEACHER EDUCATION, THIS TRAINING APPEARS BENEFICIAL. (AF)

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FINAL REPORT

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May 1967

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Richard J. McLeod

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INTRODUCTION

The Research Problem

The effect of the public school cooperating teacher on the student teacher is generally considered to be large (Steeves, 1952; Popham, 1965; Amidon, 1966). Reynard's (1963) review of research in education reports studies indicating that student teachers tend to adopt the practices of their cooperating teachers and have attitude changes during their student teaching experience in the direction of those attitudes held by their cooperating teachers. Steeves (1952) reported similar conclusions over a decade ago. Bennie (1964) also found (based on a questionnaire survey) that former student teachers felt that the university supervisor was of only "slightly more help" than the cooperating teacher. DeVault, Anderson, Swain and Cautley (1964), commenting on the efforts of teacher educators to encourage "nondirectiveness," state that anyone familiar with much of the teaching that takes place in our elementary classrooms would seriously question the effectiveness of these efforts. Flanders (1963) found that teachers of "all grade levels" were, on the average, quite directive in their teaching. If teachers are more direct, on the average, than indirect, is this trend established during the student teaching experience? If so, could this tendency of student teachers to become more direct, in spite of the theory taught them, be a result of the influence of the cooperating teacher? The scarcity of basic research in this area leaves this question largely unanswered.

Our lack of knowledge concerning the student teaching experience is, for the most part, a result of the paucity of basic, objective research in teacher-education (Reynard, 1963; Stinnett and Clark, 1960; Cyphert and Openshaw, 1964). Cogan (1963) states that a perusal of the work done by researchers "... attempting to make sense and system out of what teachers do in classrooms..." leads one ultimately to "... conclude that the underlying weakness that permeates the whole endeavor is a weakness of the primary data the researchers are dealing with" (page 242). He further decries the "verbalisms" about events taking place in the classrooms as opposed to the reality of the classroom itself. Maaske (1954) and Strom (1961) are particularly critical of the vacuous state of basic research on student teaching, while Michaelis (1957) would include the need for studying the effects of the cooperating teacher on the student teaching experience.

In a plea for more and better studies in teacher education, Reynard (1963) emphasizes that research is needed involving "techniques other than the questionnaire survey." The development of techniques of interaction analysis (Anderson and Brewer, 1945; Medley and Mitzel, 1958; Withall, 1949; Flanders, 1960) which permits one to describe objectively the classroom interaction taking place in terms of various dimensions has provided researchers with an invaluable alternative to the questionnaire. These observational tools have not only contributed much to research in education, but also hold considerable promise as a feedback mechanism for the classroom teacher.

A prerequisite to effective teacher training, according to Amidon and Flanders (1963), should be a knowledge of the norms of teacher behavior. There are various ways of learning, and educational research should aim at helping teachers to know what conditions to establish in order to maximize learning (Travers, 1958; Scheffler, 1962; Medley and Mitzel, 1961; Withall and Lewis, 1963). Representative of this point of view is the statement by Cyphert and Openshaw (1964): "Teacher-education programs might well focus on assisting teachers to find out for themselves just how they teach and then assist them in understanding the types of students and conditions under which that way of teaching is most effective" (page 29). Unfortunately, objective research in the classroom is only beginning to reveal how teachers behave and the effects of their behavior. Certainly an urgent goal of educational research must be the description of the events taking place in the classroom and the subsequent establishment of teacher behavioral norms.

While norms of teacher behavior are still in the future, it is even now possible to help the teacher determine how he behaves (in certain dimensions) and with what effects. Medley and Mitzel (1962) point out that, given this knowledge, a teacher could modify his behavior to maximize desired effects. Amidon and Flanders (1963) assert that with a technique such as interaction analysis, ". . . a teacher can be helped to define more accurately his own concept of desirable or ideal teacher behavior and subsequently to modify his behavior in the direction of that ideal" (page 1). The success of inservice teacher programs in which teachers were taught interaction analysis (Flanders, 1962, 1963) leaves little doubt that teachers can be taught (at least to some extent) to change their patterns of interaction. Flanders (1963) and Hough and Amidon (1964), among others, suggest that it might also be advantageous to teach interaction analysis to student teachers.

Within the last two years, the studies of Hough and Amidon (1964), Furst (1965), Zahn (1965), and Kirk (1965) were reported, in which the training of interaction analysis to student teachers was investigated. In each of these studies, the conclusions indicate that this training holds promise for a better student teaching experience. Amidon and Simon (1965) also report that a questionnaire completed by student teachers who have had this training reveals that they feel this training has been of significant value to them.

Kirk's investigation led him to conclude that all student teachers become more direct with increasing experience. Those trained in interaction analysis, however, became less direct than those not so trained. Zahn found that instruction and supervision in interaction analysis was related to a positive change in teaching attitude and, to some extent, supported the effect of a positive cooperating teacher attitude. Since training in interaction analysis is more directly involved with verbal patterns than with attitudes, one could speculate that an even more significant relationship might exist between the verbal patterns of the cooperating teacher and those of the student teacher. Would student teachers trained in interaction analysis tend to develop, for example, patterns of teaching more like their indirect cooperating teachers and less like those who are direct?

Purpose of This Study

In summary, basic, objective research in education is urgently needed--particularly in the neglected area of the effects of the cooperating teacher on the student teaching experience. The observational tools of interaction analysis make possible the systematic, objective observation of the events taking place in the classroom with subsequent analysis of the changes (in selected dimensions) that take place in the student teacher during the student teaching experience. The same tool applied to the cooperating teacher permits direct comparison of the changes in student teacher behavior in relationship to the behaviors displayed by the cooperating teacher. A researcher, using systematic objective observation, should be able to determine if, in fact, student teachers really do acquire the practices of their cooperating teacher.

Finally, research involving training in interaction analysis indicates this training to be beneficial to in-

service teachers and pre-service teachers. Pending the eventual establishment of teacher norms, and the ability to predict pupil behavioral outcomes in terms of teacher behavior, an important concern of research should be helping teachers to understand how they are teaching and with what effect. Kirk (1965) points out that a person facing a mirror will often modify his appearance (comb his hair, adjust a tie, etc.) in order to "improve" it--within the framework of his own opinion of his ideal self. In the same way, educational research can provide "mirrors" for the teacher to compare his teaching with his intentions.

Since the student teaching experience appears to be a period of change and moulding of the teacher-to-be, it is an ideal, if not the most crucial, period in which to help the teacher study, objectively, his own teaching as well as that of his cooperating teacher. Interaction analysis, as an observational tool, can provide a "mirror" that will help student teachers to modify their own teaching to more closely conform to their intentions.

The major hypothesis of this study was that student teachers, who possess a knowledge of the Flanders System of Interaction Analysis, would be more conscious of their verbal influence and would, of their own accord, modify their verbal behavior differently than would student teachers who did not possess such training.

This research was an effort to investigate and compare the effects of the verbal interaction exhibited by the cooperating teachers upon the verbal interaction patterns employed by their respective student teachers of secondary science:

1. Who have had conventional training (hereafter called the control group).
2. Who have had conventional training but who have had, in addition, training in the Flanders System of Interaction Analysis (hereafter called the experimental group).

The specific objectives are:

1. To identify non-random changes which occur in the teacher-student verbal interaction during the student teaching experience of both the control group and the experimental group.

2. To search for relationships between these changes and the verbal interaction of the cooperating teacher.
3. To compare the findings of both groups.
4. To indicate directions for further research.

In pursuing this study, the author assumed that:

1. Whenever a class of teachers and pupils assembles, there is a climate established which results from the social interaction of the class and the teacher.
2. The climate of the classroom affects the teaching and learning taking place.
3. The teacher is the most important influence in determining the climate of the classroom.
4. Certain aspects of the climate of the classroom can be reliably measured by means of the Flanders System of Interaction Analysis.
5. The most effective place to study the climate is in the classroom.
6. The verbal behavior of a teacher in the classroom is an adequate sample of a teacher's total classroom behavior.
7. The disturbing influence of an observer is negligible compared to other disturbing influences in the classroom.

Definitions

The following definitions will help to clarify the meaning of certain terms and words used in this study that might otherwise lead to confusion.

1. Secondary Science Class--Any junior high through high school class consisting of teacher and pupils in which general science, biology, chemistry, or physics is taught.
2. Pupil vs. student teacher--the phrase "student teacher" will be used in reference to

the college student teacher, while "pupil" or "student" will refer to those individuals who comprise the secondary science class.

3. Cooperating teacher--the public school teacher who would normally teach the class that has been assigned to the student teacher.
4. Classroom Climate--The "generalized attitude toward the teacher and the class that the pupils share in common in spite of individual differences" (Flanders, A.; p. 2).

Limitations

This study is limited to the verbal aspects of teacher and pupil behavior in the classroom. It is clearly recognized, however, that verbal interaction is only a part of the total interaction taking place. There was no effort made to test effectiveness of teaching and, hence, no effort to relate certain types of teacher behavior to effectiveness.

The classroom observations were confined to lecture-discussion type classes and omitted pupil reports of an extended nature, movies, film strips, and supervised study. It is especially regrettable that the laboratory and individual or small group work were omitted because of the nature of the observational tool.

The sample was not a random sample but, instead, consisted of all science student teachers from Cornell University who were engaged in student teaching within a radius of sixty miles from Cornell. It was possible, however, to show that the sample could have been randomly selected from the population of student teachers in science at Cornell during the period from 1963 to 1966. Thus, any generalizations must be restricted to this population.

Related Literature

Research in education has shown considerable concern for teacher effectiveness (Gage, 1963; Smith, 1962). Gage (1963) states that this concern with teacher effectiveness has "... held almost complete dominion over the conceptions that most research workers have brought to the field of teaching" (page 114). Certainly this is a worthwhile goal if teaching and learning are to be improved. Teacher educators, in particular, must become cognizant of the nature of effective teaching in order to produce better teachers.

The results, however, of this concern for teacher effectiveness have not been encouraging. Ryans (1960), Morsh and Wilder (1954), and Mitzel (1957), are in general agreement with Medley and Mitzel (1963) on the failure of this research to "... validate process criteria by correlating them with measured pupil growth" (page 249). Smith (1962) points out that "In all these studies, we proceeded as if we knew already what teaching is..." (page 326). In reality we do not. Flanders (1963) attributes the failure to distinguish between effective and ineffective teaching to an "... inability to describe teaching as a series of acts through time and to establish models of behavior which are appropriate to different kinds of teaching situations" (page 251).

In order to establish models of appropriate teacher behavior, research must concentrate on a careful quantitative description of the events taking place in the classroom. In the last decade, research in teaching has shifted the emphasis from efforts to determine effective teaching, and has concentrated on a description and an analysis of teaching behavior (Smith, 1962). Typical of this point of view is Medley's and Mitzel's (1962) statement that "It is our contention that no general theory of classroom behavior can be formulated until ways of quantifying classroom behaviors have been developed, and a large body of measurements of behaviors using these methods has been assembled" (page 1).

Until recently, objective research concerning the effects of the cooperating teacher on the student teacher has been, for the most part, nonexistent. Steeves (1952) states that the cooperating teacher has been "... almost completely overlooked as a subject for objective research." His search of the Education Index from January, 1929 through July, 1950 revealed only six examples of objective research dealing directly or indirectly with the cooperating teacher.

Since then, there have been several studies (Sandgren and Schmidt, 1956; Nagle, 1955; Price, 1961; McAulay, 1960; Loy (Hanna), 1959; Dunham (Hanna), 1959) relating to the cooperating teacher.

McAulay observed six first year teachers in an effort to relate their techniques and practices to those held by their former cooperating teachers. Although evidence indicates that the effect of the cooperating teacher was significant, the small number of teachers involved provides little basis for generalization. Price (1961), using a sample of forty-five student teachers, the MTAI and the Sanders' Observation Schedule, concluded that considerable change occurs in student teachers' attitudes during the student teaching experience. There was a tendency for these attitude changes to be in the direction of those attitudes held by their cooperating teachers. One of the "most significant" conclusions of this study was the fact that student teachers "seem" to acquire many of the teaching practices of their cooperating teachers during the student teaching experience. While Loy (Hanna, 1959), using the MTAI, identified no significant attitude changes during student teaching, Dunham (Hanna, 1959), conducting a similar study using the MTAI, obtained results consistent with those of Price.

Although these studies suggest that the effect of the cooperating teacher is significant, the need for systematic, objective research in the classroom is apparent and well supported (Cogan, 1963; Medley, 1963; Reynard, 1963; and Bellack and Davitz, 1963). Medley (1963) points out that almost everything ". . . we know today (or think we know) about teaching and learning in the classroom is based either on analogous reasoning from research done outside the classroom or on somebody's opinion about what he saw in the classroom" (page 273). Bellack and Davitz call for researchers to go into the classroom and find out "who speaks, about what, how much, when, under what conditions and with what effect."

While supporting the point that educational research ". . . has been approached in an unimaginative fashion. . .," Cyphert and Openshaw (1964) are encouraged by the ". . . several significant attempts at careful analysis of selected dimensions of the teaching act itself through study of teacher behavior in classroom situations." One dimension susceptible to objective measurement, the "climate" of the classroom, appears to be significantly related to teacher effectiveness. Mitzel and Rabinowitz

(1953) state that the psychological aspects of the classroom environment play a very important part in the learning process. They report that, "It is now generally believed that the goals of education are not maximally achieved unless the social-emotional climate of the classroom is characterized by an atmosphere of warmth, mutual respect, and permissiveness" (page 1).

The importance of the teacher in determining the "climate" is pertinent to this study. Mitzel and Rabinowitz (1953) assume that, ". . . the teacher is the most important individual in determining classroom climate, and that her verbal behavior is largely the medium for projecting her influence in the situation" (page 1). Almost twenty years ago, Reed (1946), following the pupils studied by Brewer, found that certain teacher behavioral patterns and personality characteristics persisted into a second year even though the teachers were teaching different groups of children (page 100). Withall (1951), using a set of seven categories, found that different teachers produce a different climate with the same group of pupils. DeVault and Anderson (1964), investigating teacher-pupil interaction in the classroom, found evidence that the social-emotional climate of the classroom is related to the communication patterns of the teacher as well as to the pupils' personality traits and interpersonal relations. Summarizing some of the work of Anderson and his colleagues on pre-school, primary, and elementary school classrooms, Amidon and Flanders (1963) state: "It is the teacher's principal behavior pattern that spreads among pupils and is taken over by them even when the teacher is no longer in the room" (page 51).

Evidence indicates that the classroom can be meaningfully described in terms of its social-emotional climate. Medley (1963), using the OScaR technique to study classroom interaction, reported that perhaps the most important conclusion to be drawn from his studies was the fact that ". . . meaningful measures of classroom behavior can be developed from objective records made by relatively untrained observers with a rather crude instrument--measures whose validity does not depend on the professional judgment or experience of the observer in the way that ratings do" (page 272).

Several systems of measuring the "climate" of a classroom have been developed, including those of Thomas et al., 1929; Anderson and Brewer, 1946; Withall, 1949; Mitzel and Medley, 1958; Hughes, 1959; and Flanders, 1960.

Summarizing some of these systems, Medley and Mitzel (1963) conclude:

There are differences in the terms applied to the dimension as it has been operationally defined in various studies--dominative-integrative, teacher-centered versus learner-centered, hostile-supportive, direct-indirect influence. Yet there is little question that all are referring to highly similar, even identical, dimensions of behavior reliably measurable, and important in educational theory (page 274).

They also state in their review (1963) of the major systems of assessing this "climate" that Flanders has developed ". . . the most sophisticated technique for observing climate thus far, one which is unique in that it preserves a certain amount of information regarding the sequence of behavior" (page 271). The concern of the Flanders System is verbal interaction with the assumption that the verbal behavior of an individual is an adequate sample of his total behavior.

The Flanders technique utilizes ten mutually exclusive categories to describe the verbal communication behavior taking place in consecutive three second time intervals. At the termination of the observation period, the observer possesses a sequence of numbers which are then plotted into a 10 x 10 matrix, each number entered in such a way that sequence information is retained. An analysis of the matrix in terms of rows, columns, and areas yields percentages of time devoted to particular aspects of verbal interaction as well as sequence and pattern information.

Flanders (1964) has divided the ten categories into seven assigned to teacher talk, two to student talk, and one for silence or confusion. The teacher talk categories are divided into indirect and direct influence, where indirect influence encourages student participation and thus increases his freedom of action. "Direct influence increases the active control of the teacher and often stimulates conformity and compliance" (page 3). Flanders (1964b) leaves little doubt that there is such a thing as an indirect teacher and a direct teacher. He points out, however, that no teacher is purely direct or indirect, and that there is a blending which results in the development of a stable pattern over long periods of time. Teachers can be described as possessing a tendency towards directness

or indirectness by differences in their overall patterns.

Research Employing Interaction Analysis

The Flanders system of interaction analysis was used by Amidon and Giammatteo (1965) in a study of the verbal behavior of "superior teachers." Thirty-three superior teachers (as identified by administrators and supervisors) were observed and compared with a control group of "average" teachers who were randomly selected from the same school district. An analysis of the matrices revealed that "superior teachers can be identified and that their patterns do differ markedly from the verbal-behavior of other teachers" (page 285). In general, the superior teachers talked less, were more accepting and encouraging of pupil ideas, and tried to build on their ideas to a greater degree than did the "average group."

The success enjoyed by this study is, perhaps, marred by the possibility that administrators and supervisors may judge teachers "superior" on the very criteria that Amidon and Giammatteo used to discriminate between teachers, viz., the quantity and kind of teacher talk. The ability of administrators and supervisors to judge superior teachers is in serious question (Jayne, 1945; Anderson, 1955). Summarizing several studies which attempted to compare ". . . judgments of teacher effectiveness (made by experts) and actual measurements of changes in pupils," Medley and Mitzel (1962) conclude that ". . . a characteristic highly correlated with 'effectiveness' as judged by a supervisor or other trained person is no more likely to be correlated with measured effectiveness than any other" (page 6).

There have been studies, however, which did attempt to correlate various pupil behavioral outcomes with the verbal behavior of the teacher as described by the Flanders system of interaction analysis. Flanders (1963), creating a role-playing situation under laboratory conditions, found that a sustained dominative pattern was consistently disliked by pupils, reduced their recall, and produced adverse psychological and physiological effects on the part of the pupils. A sustained integrative pattern produced the opposite reactions. Amidon and Flanders (1963) found that students of direct teachers learned less than those working with indirect teachers. The earlier investigations of Anderson and Brewer (1945, 1946) and Lippitt and White (1943) reported similar conclusions in terms of the

dominative vs. integrative dimension, and authoritarian vs. democratic leadership, respectively. Snider (1965), however, using the Flanders System of Interaction Analysis in a study of high school physics teaching, found that those teachers who were more direct in their lecture techniques were more effective in terms of student performance on the New York Regents Physic Examination and on the Test on Understanding Science. However, "no single measure of the study appeared as a factor of teacher effectiveness for all aspects of effectiveness considered" (page 13).

The tendency to jump to the conclusion that one type of teaching is more effective than another must be resisted (Rehage, 1951; Smith, 1962). Smith, commenting on the practice of claiming superior teaching for certain types of behaviors, states: "I believe that the outcome of this practice will be to throw us back again into pedagogical dogmas and doctrines that have burdened pedagogical thought throughout its history" (page 326). Smith questions whether teaching is ever "all of this or all of that" but wonders if it is ". . . not always a mixture as Flanders says."

Teachers are not purely direct or indirect. In fact, the flexibility of a teacher, according to Flanders, is more directly related to pupil achievement than is the directness or indirectness of his verbal behavior (Flanders, 1960a; 1962; 1963; 1964b). In a study of seventh and eighth grade social studies and mathematics classes, Flanders (1964b, 1963) concluded that teachers who were more flexible, i.e., able to shift from very indirect to very direct with the passage of time, had students who learned more (based upon attitude and achievement scores). Teachers in the superior classrooms spoke only "slightly less" than those in the classrooms not rated superior but the directive aspects of their verbal influence decreased significantly.

Although the different types of interaction analysis were developed chiefly as research tools, it was quickly recognized (Flanders, 1963; Amidon and Hunter, mimeograph; Amidon and Flanders, 1963; Hough and Amidon, 1964) that such a tool might be valuable in teacher education. A statement by Amidon and Hunter is representative:

The use of a system such as this one helps to provide teachers with an attitude of inquiry toward the entire area of teaching behavior.

They will become conscious of the importance of verbal patterns, and may find that they wish to change, adapt or expand specific verbal patterns of which they were not aware before being provided with a system of objective feedback (page 17).

Beginning in 1960, Flanders (1962, 1963) offered inservice training to teachers in the technique of interaction analysis. The emphasis was on adapting teacher behavior to classroom learning activities and on discussions concerning when direct and indirect patterns are most appropriate. Although increased flexibility is "usually associated with an increase in the I-D ratio (ratio of indirect to direct teacher talk), "more indirect was never advocated as a goal in itself." A spirit of inquiry prevailed, with teachers exploring various patterns of teaching and deciding for themselves which were most effective.

Fifty-one teachers were divided into two groups in an effort to test different approaches to the teaching of interaction analysis. One presentation was quite direct and restrictive while the other was taught in an indirect manner. Both groups increased significantly in their use of indirect statements. It is interesting to note that those teachers who were initially indirect made the highest gain (in terms of I-D ratio) when taught by an instructor using an indirect approach, while the more direct teachers were somewhat insensitive to the difference in instruction. The more direct teachers made higher gains under both types of teaching than did the more indirect teachers. Although the control group had higher gain than either of the experimental groups, comparisons cannot be made because it was ". . . too small and did not produce stable measures of interaction analysis" (page 131). The results show, however, that teachers can be taught to change their behavior.

It is logical, then, to investigate the effects of training in interaction analysis on student teachers. Hough and Amidon (1964) were among the first to try this. They instituted an experimental course for student teachers in which traditional content about learning theory was combined with instruction and practice in the use of interaction analysis. All of these students were concurrently undertaking student teaching. A control group received similar instruction with the exception of the training in interaction analysis. Hough and Amidon were able to support their hypothesis that student teachers

in the experimental group would be rated by their college supervisors as more effective than student teachers in the control group. Unfortunately, Hough and Amidon did not use interaction analysis to assess behavioral changes but relied instead on rating sheets and attitude tests.

Furst (1965) recognized the limitations of rating scales and designed a study to observe objectively classroom behavior of English and Social Studies student teachers. The teaching behavior of students who had been trained in the use of Flanders Interaction Analysis was compared with the teaching behavior of student teachers who had been more conventionally trained. There was no feedback to the students during their student teaching experience which involved interaction analysis, and the college supervisor did not require or "even necessarily encourage" the student teachers to use interaction analysis. Furst concluded that student teachers, who were taught interaction analysis, differ significantly from those not so trained in: more teacher acceptance of student ideas, less rejection of student behavior, and more positive change scores on the Teaching Situation Reaction Test.

Kirk (1965) studied the effects of a knowledge of interaction analysis upon student teachers' tendency to alter elements of teaching style common (as revealed by this study) to student teachers of elementary grades. The experimental treatment consisted of approximately five hours of seminar time and individual conferences occurring immediately after weekly visits by the college supervisor. These conferences utilized the tally sheet of the lesson just observed. Kirk concludes:

The student teachers in the experimental group, when compared with the control group: (a) talked less, (b) resisted to a greater degree the tendency of student teachers to become more direct as their experience matures, (c) gave fewer directions, and (d) asked more questions in immediate response to their pupils' voluntary contributions. The pupils in the experimental classes, when compared with those in the control classes: (a) talked more, (b) talked more spontaneously, (c) talked at greater length per contribution, and (d) interjected their own ideas into the discussions more freely (page 3).

He found that both groups, however, became more direct

with increasing experience. This is particularly pertinent to the proposed study. Was this change in the direction of more direct teaching related to the verbal patterns of the cooperating teachers?

In an effort to determine the effect of the co-operating teacher's verbal behavior on the verbal behavior exhibited by their student teachers, Matthews (1965) studied eighteen student teachers and their cooperating teachers. Using the Flanders system of interaction analysis in his observations, Matthews confirmed Kirk's conclusion concerning the tendency of student teachers to become more direct with increasing experience. The student teachers, however, did not have training in the technique of interaction analysis. In general, the non-random verbal changes that could be related to the verbal patterns of the cooperating teacher were limited to pauses following teacher questions and directions. One notable exception concerned pupil-initiated comments. Matthews found that the pupils of student teachers increased their use of extended pupil-initiated comments as the student teacher became more experienced. This change was in a direction tending to be less like the pupil-initiated talk in the classes of their cooperating teachers.

Zahn (1965) used a control and experimental group design in which four groups of 23 students each were involved. Groups "A," "B," and "C" were given "conventional" instruction and supervision. The students in group "D" underwent 15 hours of instruction in interaction analysis and their supervision involved its use. Although group "C" was given "conventional" supervision, both groups "D" and "C" were supervised by Zahn.

A comparison of the change of TSRT scores from pre- to post-test revealed that groups "A" and "B" became 1.05 points more negative while group "C" became 3.09 points more positive and group "D" 6.05 points more positive. Zahn states that the personality of the supervisor also has an influence as noted in the positive change of group "C".

The post-student teaching TSRT scores of student teachers whose pre-student teaching TSRT scores were at or above those held by their cooperating teachers were examined for a tendency to move toward or away from their cooperating teachers' TSRT scores. Groups "A," "B," and "C" were found to move "approximately 2.1 or 3.1" points negative and towards the cooperating teacher while group

"D" moved 4.1 points positive and away from the cooperating teacher. Zahn concludes that instruction in interaction analysis "appears" to be related to a positive change in teaching attitude, and supports, to a degree, the effect of a positive cooperating teacher attitude or reduces the effect of a negative cooperating teacher attitude.

Since training in interaction analysis is more directly involved with verbal patterns than with attitudes, the trends reported by Zahn are of particular importance to this study. Will student teachers who are initially more indirect than their cooperating teachers become even more so if they have had training in interaction analysis? How will their changes, when compared with different types of cooperating teachers, compare with those student teachers who have not had such training?

In summary, the research indicates that: (1) there is an urgent need for a wealth of objective research relating to the student teaching experience and the cooperating teacher; (2) interaction analysis can be used to objectively describe the "climate" of the classroom in terms of teacher-student verbal interaction; (3) this "climate" appears related to teaching effectiveness and; (4) training in interaction analysis enables teachers to change their verbal behavior and appears beneficial to the student teaching experience. In view of the reported tendency for teachers to become more direct and the indications that this trend may begin during the student teaching experience, additional research is needed to determine the effect of training in interaction analysis upon this tendency and to relate these findings to the patterns of teaching exhibited by the cooperating teachers.

METHOD

Population and Sample

Before describing the selection of the control and experimental group, the author wishes to point out that he is deeply indebted to Matthews (1965) for all of the control group data. The use of this data as a control is made possible by: (1) using the same observational technique in both studies, (2) establishing observer reliability between groups, and (3) establishing the likelihood that both groups could have been randomly selected from the same population. These requirements have been met and will be described in more complete detail in sub-

sequent sections.

Selection of Experimental and Control Groups

The population from which the sample was drawn consisted of all student teachers of science at Cornell University who were engaged in student teaching during the fall semester of the school years 1964-1965 and 1965-1966. Unfortunately, the small number of science student teachers available did not lend itself to random sampling techniques. Although the statistical techniques that are applied in the analysis of the data are applicable to much smaller groups, it was the opinion of the investigators that a larger sample would result in more meaningful data. For this reason, it was decided to include the entire population in the study with the exception of those student teachers who were assigned to schools in Rochester, New York. The inclusion of these student teachers in Rochester (only two in the experimental group) would have resulted in considerable increased travel time. The accompanying expense could not be justified in terms of a comparable increase in information. It was also unfeasible to include these teachers in the weekly instruction in interaction analysis--the experimental variable.

To determine the likelihood that the experimental and control groups could have been randomly selected from the population of student teachers of science at Cornell, the Kolmogorov-Smirnov One-Sample Test was applied to selected criteria available for the population of student teachers of science at Cornell. The Kolmogorov-Smirnov One-Sample Test is a measure of the agreement between the distribution of a sample variable and a theoretical distribution of that variable. This test will permit one to determine whether the scores in a sample can "... reasonably be thought to have come from a population having the theoretical distribution" (Siegal, 1956, page 47).

In this study, the theoretical distribution was the actual distribution of the variable in question for all student teachers of science at Cornell University from 1963 to 1966 (hereafter referred to as the "extended population"). For each score considered, the null hypothesis tested was:

H_0 : There is no difference between the sample

distribution of X and the distribution of X for the extended population. $\alpha = 0.05$

To perform this test, a cumulative frequency distribution of each variable considered is determined for the extended population and for the sample. These distributions are referred to as $F_o(X)$ and $S_n(X)$ respectively.

The maximum absolute difference

$$D = \text{maximum } F_o(X) - S_n(X)$$

is then determined, and this difference is compared to a table of differences for the sample sizes considered and the alpha level desired.

The criteria selected were chosen primarily on the basis of availability of information for the extended population. For this reason, the criteria selected were: (1) S.A.T. scores upon entrance to Cornell University, (2) third year cumulative average, (3) Allport Vernon Lindzey Study of Values scores, and (4) Opinion Attitude Interest Survey scores (Bruce, 1966).

The Kolmogorov-Smirnov One-Sample test for the experimental group is summarized in Table 1 (see Appendix A for scores). It should be pointed out that the sensitivity of this test is increased by reducing the size of the interval in the frequency distribution. In performing this test, the author chose to make it as sensitive as possible by using an interval of unity. Even with this sensitivity, it was possible to reject the null hypothesis for only two of the twenty-three scores at the 0.05 level. Many of the probabilities were considerably greater than 0.20 (the highest probability listed). It was also possible, using the same criteria, to demonstrate that the control group could have been selected from the same population (Matthews, 1965). Therefore, it was considered reasonable to assume that these groups could have been randomly selected from the extended population--permitting comparisons between groups and generalizations to the extended population.

The Observational System

The Flanders System of Interaction Analysis was used to systematically observe the student teachers and

TABLE 1
KOLMOGOROV-SMIRNOV ONE-SAMPLE TEST OF THE DIFFERENCE BETWEEN
THE DISTRIBUTIONS OF THE EXPERIMENTAL GROUP AND THE
EXTENDED POPULATION

Criterion	Max. D	Probability under H_0
S.A.T. at entrance		
1	.334	$p < .15$
2	.302	$p > .20$
Cumulative average		
3rd year		
3	.308	$p < .20$
Allport Vernon		
Lindzey Study of		
Values		
4	.034	$p > .20$
5	.213	$p > .20$
6	.069	$p > .20$
7	.169	$p > .20$
8	.146	$p > .20$
Opinion Attitude		
Interst Survey		
10	.160	$p > .20$
11	.197	$p > .20$
12	.277	$p > .20$
13	.459	$p < .05$
14	.180	$p > .20$
15	.212	$p > .20$
16	.131	$p > .20$
17	.170	$p > .20$
18	.213	$p > .20$
19	.196	$p > .20$
20	.158	$p > .20$
21	.185	$p > .20$
22	.241	$p > .20$
23	.394	$p < .05$

cooperating teachers in both control and experimental groups. It was also taught to the experimental group and, thus, became the independent variable. This system is limited to the classroom verbal behavior of pupils and teachers with emphasis on the verbal behavior of the teacher.

The Flanders System of Interaction Analysis is comprised of ten mutually exclusive categories (see Table 2). Seven of these categories are assigned to teacher-talk, two describe student talk, and one is reserved for silence or confusion. An observer using this system records, in each three-second interval, the category that most accurately describes the verbal behavior taking place. Any distinct changes in categories of verbal behavior are recorded regardless of the time unit. Thus, a three second interval can be represented by more than one category if shifts are made during the three seconds.

A completed observation appears as a series of numbers which are then plotted into a 10 x 10 matrix. Subsequent analysis of the one hundred cells and combinations of cells yields insight into the kinds of influence that the teacher exerted during the class period.

To illustrate the procedure, suppose the following discourse takes place for a short period of time:

Teacher: You have now determined the period of the pendulum (category 5). Can anyone guess the effect on the period if we lengthen the pendulum? (category 4).

Pupil: I think that it would be longer (category 8). I have noticed that a long swing suspended from a high tree gives a longer ride than the short ones on the playground (category 9--pupil shifted to his own idea after answering the teacher's question).

Teacher: That's very good reasoning, John (category 2). Do you mean that a swing is actually a pendulum (category 3--clarifying pupil's statement).

Pupil: Yes (category 8).

Teacher: Would you say, then, that a swing that is twice as long as the one you refer

TABLE 2

FLANDERS CATEGORIES FOR VERBAL INTERACTION ANALYSIS**

<u>TEACHER TALK</u>	
INDIRECT INFLUENCE	1.* ACCEPTS FEELING: accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting or recalling feelings are included. 2.* PRAISES OR ENCOURAGES: praises or encourages student action or behavior. Jokes that release tension, not at the expense of another individual, nodding head or saying "um hm?" or "go on" are included. 3.* ACCEPTS OR USES IDEAS OF STUDENT: clarifying, building, or developing ideas suggested by a student. As a teacher brings more of his own ideas into play, shift to category five. 4.* ASKS QUESTIONS: asking a question about content or procedure with the intent that a student answer.
DIRECT INFLUENCE	5.* LECTURING: giving facts or opinions about content or procedure; expressing his own ideas, asking rhetorical questions. 6.* GIVING DIRECTIONS: directions, commands, or orders to which a student is expected to comply. 7.* CRITICIZING OR JUSTIFYING AUTHORITY: statements intended to change student behavior from nonacceptable to acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.

TABLE 2 (cont'd.)

STUDENT TALK

- 8.* STUDENT TALK--RESPONSE: a student makes a predictable response to teacher. Teacher initiates the contact or solicits student statement and sets limits to what the student says.
- 9.* STUDENT TALK--INITIATION: talk by students which they initiate. Unpredictable statements in response to teacher. Shift from 8 to 9 as student introduces own ideas.

-
- 10.* SILENCE OR CONFUSION: pauses, short periods of silence and periods of confusion in which communication cannot be understood by the observer.
-

*There is NO scale implied by these numbers. Each number is classifactory, it designates a particular kind of communication event. To write these numbers down during observation is to enumerate, not to judge a position on a scale.

**From: Flanders, Ned A., 1964a.

to would have a period that is twice as long? (category 3--teacher building on pupil's idea).

An observer witnessing the above discourse would have recorded the following:

5, 4, 8, 9, 2, 3, 8, 3

This information is then plotted into a 10 x 10 matrix to facilitate analysis of the discourse. The plotting is done by pairs and will result in unequal row and column totals unless the first and last number in the sequence is the same. By convention, a 10 is added to the beginning and end of the series unless a 10 is already present. Thus, the sequence to be plotted becomes:

10, 5, 4, 8, 9, 2, 3, 8, 3, 10

The first pair is 10-5 and is represented by a tally in the 10-5 cell. This is the cell formed by the intersection of row ten and column five. The second pair is 5-4 and its tally is entered in the cell formed by the intersection of row 5 and column 4--the 5-4 cell. This process is continued until tallies representing all pairs have been entered into the matrix. The finished matrix is shown in Table 3.

Matrix Analysis

The matrix furnishes a very convenient method of viewing the sequence of numbers. For example, all tallies in row eight refer to teacher talk following student response. To avoid confusion on matrix interpretation, it is well to remember that the columns yield the amount of talk falling in a specific category, while the rows refer to the verbal behavior preceding that category. Thus, the 8-2 cell indicates the amount of time devoted to praise and encouragement following student response. The 8-7 cell shows the amount of time devoted to criticism of student response.

If, for example, class participation is a desired outcome, the teacher probably will attempt to stimulate

TABLE 3
EXAMPLE OF MATRIX TABULATION

	1	2	3	4	5	6	7	8	9	10	T
1	A 1										0
2											1
3								1		1	2
4								1			1
5				1							1
6						B					0
7											0
8			1						1		2
9		1									1
10					1						1
T	0	1	2	1	1	0	0	2	1	1	9
%	0	11.1	22.2	11.1	11.1	0	0	22.2	11.1	11.1	100

student response by praise or encouragement. This encouragement would be reflected in heavier than normal loadings in the 8-2 cell. More generally, one might look to the area A (Table 3) for an indication of a teacher's attempt to encourage student participation. Flanders (1963) refers to this area as the area of "constructive integration." In A, we find the 1-1, 2-2, and 3-3, cells. These are called steady state cells--i.e., cells indicating extended use of a particular category. Praise and encouragement that is longer in duration is more apt to achieve the desired effect (Flanders, 1963). Heavy loadings in the 3-3 cell, for example, imply that a teacher is taking time to clarify and build on student ideas. In addition to these steady state cells, the 3-2 and the 2-3 cell indicate shifts from clarifying to praise and vice versa. This entire area, A, then, is a measure of a teacher's attempt to involve the students.

While other areas and cells are equally important, the author feels that the above examples will suffice to show the value of the matrix as an analytic tool. Further explanation and examples of matrix interpretation will be given in the next section.

Selected Scores Considered in This Study

Matthews (1965) selected 59 scores that represent various aspects of the classroom verbal interaction. These same scores have been computed for the experimental group and are presented in Tables 4-8. Since these scores pertain to various aspects of classroom interaction, they have been grouped according to the criterion measured.

Table 4 presents those scores which measure selected aspects of teacher-talk. In addition to each category percentage (e.g., the percentage of teacher time devoted to questions), there are such measures as the persistence of teacher talk in the various categories (e.g., extended criticism indicates the amount of continued criticism lasting 5 seconds or longer). A teacher who uses a minimum of extended praise and acceptance of student ideas, but frequently uses extended directions and criticism, could be creating a negative class attitude. Heavy emphasis on extended directions only might, however, merely indicate that the teacher is giving very careful directions. An analysis of the entire matrix would help to reveal the implications of this emphasis.

TABLE 4

SELECTED ASPECTS OF TEACHER TALK EXPRESSED AS PERCENTAGES

Score	Computation
T accepts feelings	col. 1/matrix total
T praise and encouragement	col. 2/matrix total
T accepts ideas	col. 3/matrix total
T questions	col. 4/matrix total
T lectures	col. 5/matrix total
T directions	col. 6/matrix total
T criticism	col. 7/matrix total
T talk	cols. 1-7/cols. 1-9
T accepts feelings/T talk	col. 1/cols. 1-7
T praise/T talk	col. 2/cols. 1-7
T accepts ideas/T talk	col. 3/cols. 1-7
T asks questions/T talk	col. 4/cols. 1-7
T lectures/T talk	col. 5/cols. 1-7
T directions/T talk	col. 6/cols. 1-7
Teacher criticism/T talk	col. 7/cols. 1-7
Content	cols. 4-5/matrix total
Extended T accepts feeling	cell 1-1/matrix total
Extended T praise	cell 2-2/matrix total
Extended T accepts ideas	cell 3-3/matrix total
Extended T asks questions	cell 4-4/matrix total
Extended T lecture	cell 5-5/matrix total
Extended T directions	cell 6-6/matrix total
Extended T criticism	cell 7-7/matrix total
Total T steady state	cells 1-1,2-2,3-3,4-4, 5-5,6-6,7-7,8-8, 9-9,10-10/matrix total

Table 5 describes those scores that pertain to student talk. The percentage of student response and student initiated talk indicates the freedom that exists in the classroom. Extended S response and S initiated talk are indications of the degree to which a student is permitted to develop his ideas.

Table 6 displays those scores which are associated with the indirect-direct aspect of classroom interaction. I/I+D is a measure of the amount of time a teacher spends expanding student ideas compared to the amount of time he spends restricting student participation. The revised I/I+D percentage removes the influence of teacher questions and teacher lecture. Since lecture usually represents a major part of a teacher's time, its removal from the denominator yields a more sensitive measurement of the indirect-direct aspect of teacher-pupil interaction. The Row 8 I/I+D score is a measure of the teacher's acceptance of student response. Similarly, Row 9 I/I+D indicates a teacher's acceptance of student initiated ideas. The Row 8 and 9 I/I+D score is a comparison of a teacher's indirect response following pupil-talk to his total response following pupil-talk. This score is particularly sensitive to a teacher's effort to encourage student participation. Area A has been previously explained as the area of "constructive integration," while area B (see Table 3) is referred to by Flanders (1964a) as the "vicious circle." Heavy loadings in area B usually indicates a teacher giving directions to which the students offer resistance. This is then followed by criticism which results in even more resistance. This type of "vicious circle" would most likely be characterized by particularly heavy loadings in the 6-7 and the 7-6 cells.

Table 7 presents selected scores representing various kinds of teacher talk following student talk. Each is expressed as the percentage of total student talk. It can easily be seen, for example, that criticism following student talk will have quite a different effect on the classroom climate than praise. The last score, the Student Initiated Talk/Student Talk, reveals the percentage of student talk which is student initiated. Presumably, a high percentage for this score would indicate a class in which students felt considerable freedom to express their own ideas.

Table 8 indicates selected scores involving silence or confusion. Of particular interest is the amount of

TABLE 5

SELECTED ASPECTS OF STUDENT-TALK EXPRESSED AS PERCENTAGES

Score	Computation
S response	col. 8/matrix total
S initiated	col. 9/matrix total
S talk	cols. 8-9/matrix total
Extended S response	cell 8-8/matrix total
Extended S initiated	cell 9-9/matrix total

TABLE 6

SELECTED ASPECTS OF VERBAL INTERACTION ASSOCIATED WITH
INDIRECTNESS-DIRECTNESS

Score	Computation
I/I+D	cols. 1-4/cols. 1-7
Revised I/I+D	cols. 1-3/cols.1-3 + cols. 6-7
Row 8-9 I/I+D	cells 8-1,2,3,4;9-1,2,3,4/ cells 8-1,2,3,4,5,6,7;9-1,2, 3,4,5,6,7
Revised row 8 I/I+D	cells 8-1,2,3/cells 8-1,2,3, 6,7
Revised row 9 I/I+D	cells 9-1,2,3/9-1,2,3,6,7
Area A	cells 1-1,2,3;2-1,2,3;3-1, 2,3/cols. 1-7
Area B	cells 6-6,7;7-6,7/cols. 1-7

TABLE 7

SELECTED ASPECTS OF VERBAL INTERACTION FOLLOWING STUDENT
TALK EXPRESSED AS PERCENTAGES OF TOTAL STUDENT TALK

Score	Computation
T accepts feeling following S talk	cells 8-1, 9-1/cols. 8-9
T praises following S talk	cells 8-2, 9-2/cols. 8-9
T accepts ideas following S talk	cells 8-3, 9-3/cols. 8-9
T questions following S talk	cells 8-4, 9-4/cols. 8-9
T lectures following S talk	cells 8-5, 9-5/cols. 8-9
T directions following S talk	cells 8-6, 9-6/cols. 8-9
T criticism following S talk	cells 8-7, 9-7/cols. 8-9
S response following S talk	cells 8-8, 9-8/cols. 8-9
S initiated following S talk	cells 8-9, 9-9/cols. 8-9
Silence following S talk	cells 8-10, 9-10/cols. 8-9
S initiated/S talk	col. 9/cols. 8-9

TABLE 8
SELECTED ASPECTS OF "SILENCE OR CONFUSION" EXPRESSED
AS PERCENTAGES

Score	Computation
Silence following T accepts feeling	cell 1-10/ col. 10
Silence following T praise	cell 2-10/ col. 10
Silence following T accepts ideas	cell 3-10/ col. 10
Silence following T questions	cell 4-10/ col. 10
Silence following T lecture	cell 5-10/ col. 10
Silence following T directions	cell 6-10/ col. 10
Silence following T criticism	cell 7-10/ col. 10
Silence following S response	cell 8-10/ col. 10
Silence following S initiated	cell 9-10/ col. 10
Extended silence/silence	cell 10-10/col. 10
Total silence	col. 10/ matrix total
Extended silence	cell 10-10/matrix total

silence following student talk. Student talk that is not immediately acknowledged can indicate a failure to accept student ideas and will probably be accompanied by a low percentage of total student talk. On the other hand, a high percentage of silence or confusion following student talk could indicate thoughtful pauses. Flanders (1964) points out that the extended silence can have a variety of meanings. For example, it can indicate "thoughtful pauses or a slow tempo of interaction." On the other hand, if there is considerable criticism present, a heavy loading in the 10-10 cell may reveal a lack of cooperation or indifference.

Many of the above scores have been found to have significant correlation with certain pupil behavioral outcomes. Others are purely exploratory.

Observer Training

Only one observer was used in this study. Neither the author nor the observer was initially familiar with the Flanders System of Interaction Analysis.

The first step in training consisted of a series of meetings between the author and a fellow graduate student who had just returned from a workshop in the Flanders System of Interaction Analysis which was conducted at Temple University. The five filmstrips and audio tapes developed by Flanders (1963a) were viewed by both persons and discussed. Short segments of the fifth filmstrip, which is mainly a recording of a class situation, were then coded by each person and differences in coding were discussed. This phase of the training lasted for approximately one week. At that time, both persons obtained observer reliability coefficients over .90.

The observer for this study was then trained by the author using the same procedure as above. The five filmstrips and audio tapes were viewed and discussed by the author and the observer. Again, the fifth audio tape was coded in short segments until high observer agreement was reached. At that time, Matthews was contacted and sample tapes of the classes observed in his study were coded by the observer. Initially, observer agreement between Matthews and the observer in this study was low (approximately 60%). It was apparent that our ground rules for observing were not the same.

By working together on tapes and immediately com-

paring differences in coding, it was possible to identify the problem areas. The observer for this study then modified her coding to coincide with that of Matthews. It was necessary for the observer of this study to modify her coding rather than reach mutual agreement, because the data for the Matthews study had already been collected. The additional ground rules established at that time are referred to as the "special ground rules" and are presented in the following section.

Ground Rules

Although the categories in the Flanders System of Interaction Analysis are mutually exclusive and appear to require little observer judgment, the actual classroom situation has a way of presenting discourse that is not clearly defined and, hence, requires a certain amount of observer judgment. To facilitate consistency in these judgments, the author used the following ground rules (Flanders, 1964a):

Flanders Ground Rules (1964a)

1. If there is a choice in a three second interval between more than one category, record the one most distant numerically from category five with the exception of category ten.
2. Use caution in shifting from one area of influence (direct or indirect) to another unless this shift is clearly indicated.
3. Verbal habits such as the use of "good" or "ok" after student responses should be distinguished from genuine praise. To do this, the observer must put himself in the place of the student and judge whether this phrase is given so freely that it has little or no encouragement value.
4. During spontaneous student-to-student communication, a ten is inserted to designate when one student stopped talking and another began. These ten's are inserted as extra observations.

In addition to the above ground rules presented by

Flanders, the author and Matthews found it necessary to develop additional ground rules in order to establish observer reliability with the Matthews' observations. These additional ground rules are presented below:

Special Ground Rules

1. Category "2" is used only to indicate encouragement to a student to continue talking. It is not used for a terminal acceptance such as an "ok" or "good". If, however, short expressions like the above result in continued student talk, they should be construed as encouragement and categorized as a "2". Terminal acceptance of student talk such as a terminal "ok" or "good" are coded as a "3."
2. Directing someone to talk is always categorized as a "4." Calling someone by name is always a "4" if a question is involved or implied. Otherwise it is coded as a "5." An example might be a teacher calling the name of a student who is misbehaving. He doesn't usually expect the student to talk but is rather expressing in that one comment his opinion or desire for the student to cease the behavior taking place.
3. When a teacher accepts a student's ideas and/or builds on them, he frequently makes an almost imperceptible transition from this building on the student's ideas to lecturing or putting forth his own ideas and opinions. Thus, the observer must be ready for this and shift from a series of "3's" to "5's" when the teacher shifts to statements that probably would have been made anyway.
4. Category "6" is used only when the teacher expects the students to do something. It is not used to direct a student to speak.
5. If the teacher asks a question to which he obviously doesn't expect an answer, or proceeds to answer the question himself, without waiting for a student response, a "5" is

recorded.

6. Teachers frequently ask questions in a reverse fashion. For example, a teacher might say, "The most active group of elements on the periodic chart is what?" Since the students do not know that a question is being asked until the final "is what," the whole statement is coded as a "5" and only the final "is what" is coded as a "4." In this way, the observer is, hopefully, coding the discourse as the students have perceived it.
7. An "8" is reserved for student response to teacher talk. Thus an "8" would not follow a "3" (teacher acceptance or a student idea or clarification of a student idea) unless the "8" is in response to a "4" preceding the "3."
8. A student's response after a "4" is always coded as an "8" to begin with, followed by a shift to category "9" as the student begins to interject his own ideas. The only exception to this occurs when a student's response bears little or no relationship to the question asked by the teacher.
9. When interruptions occur during the class (such as another teacher entering the room to talk with the teacher or the public address system interrupting) a maximum of two "10's" are used to indicate the interruption.
10. A maximum of ten "10's" were used to indicate a break such as a transition to laboratory or small group work. This ground rule was established without consultation with Matthews and resulted in a slightly higher percentage of "10's" in the experimental group than in the control group. The difference caused by the failure to agree on this ground rule is very small and does not affect most of the scores since they do not include category "10". It should be noted that Matthews used a maximum of four zeroes in the above cases. Since a change of this type would usually occur at most once in a class period, there

would be a difference of six "10's" in that period consisting of six hundred to a thousand total tallies. Thus, the percentage would amount to less than one percent. Further reference will be made to this difference in coding as the analysis proceeds.

These special ground rules are not presented as "good" or "bad" additions to those of Flanders. Their only purpose was to improve the consistency of observer judgments in especially troublesome cases. They are not intended to have wide applicability but rather, were developed particularly to meet the needs of this study. They served their purpose in improved observer reliability.

Observer Reliability

Although only one observer was used in this study, it was important that the observer obtain data consistent with that obtained by Matthews. That is, the inter-observer reliability had to be established between the observer in this study and Matthews. In addition, it was considered important to maintain frequent checks of the stability of the observer--i.e., the ability of the observer to obtain the same information from the same observation. This estimate of stability will be referred to as intra-observer reliability.

The estimate of reliability used was Scott's coefficient of reliability " π " and is determined by the formula:

$$\pi = \frac{P_o - P_e}{1 - P_e} \quad (\text{Flanders, 1964a, p.10})$$

P_o is the proportion of agreement between observers and P_e is the proportion of agreement that would be expected by chance alone. P_o and P_e are obtained from the formulas below.

$$P_o = 100 - \sum_{i=1}^k |P_{i1} - P_{i2}|$$

$$P_e = \sum_{i=1}^k P_i^2$$

In the case of the Flanders System of Interaction Analysis, k is equal to the number of categories, 10. The percentage of tallies falling into each category, P_i , is obtained by dividing the number of tallies in each category by the total number of tallies in the matrix. The subscripts "1" and "2" refer to observers one and two. Thus, the coefficient " p_i " becomes the amount that two observers exceed the expected agreement by chance, divided by the amount perfect agreement exceeds chance agreement.

Commenting on Scott's coefficient of reliability, Flanders (1963, p. 10) states that the coefficient is ". . . unaffected by low frequencies, can be adapted to percent figures, can be estimated more rapidly than an adaptation of Chi-square in the field, and is more sensitive at higher levels of reliability."

Once the observer was trained, conferences were held with Matthews to establish agreement on "ground rules" and discuss mutual problems of coding. When the observer and Matthews had reached high levels of reliability on tapes coded together, it was decided to establish reliability with the tapes that Matthews actually recorded and coded with the control group. The reasoning behind this reliability test was that Matthews could have changed his method of coding since working with the control group. Thus, establishing reliability on new tapes did not necessarily establish reliability with Matthews as the observer for the control group. Matthews randomly selected 5 tapes and the copies of the corresponding raw data as he recorded it on paper at the time of his study. The observer for this study then listened to the tapes and categorized them--without, of course, benefit of seeing the data submitted by Matthews. Reliability was then assessed using the Wightman Program for Interaction Analysis (Wightman, 1965). The results are listed in Table 9.

With the exception of tape 63, the reliability coefficients are quite satisfactory (Flanders, 1964). The low reliability on tape 63 was primarily due to category 10. There were several pauses interspersed in the lecture and these pauses were given more emphasis by the observer in this study than by Matthews. This resulted in a

TABLE 9

INTER-OBSERVER RELIABILITY

	1	2	3	4	5	6	7	8	9	10	Reli- ability
<u>Tape 44</u> <u>Ruhl</u>											.81
(221 total tallies)	0	0	2.7	8.6	41.6	22.6	.5	9.0	1.8	13.1	
<u>Percent of Tallies in Category</u>											
Matthews (204 total tallies)	0	0	5.4	8.8	41.2	25.0	1.5	8.3	2.5	7.4	
Absolute difference	0	0	2.7	.2	.4	2.4	1.0	.7	.7	5.7	
<u>Tape 96</u> <u>Ruhl</u>											.86
(477 total tallies)	0	.2	2.7	8.8	39.2	2.5	1.7	6.5	2.7	35.6	
Matthews (471 total tallies)	0	.8	2.8	7.4	41.8	4.0	1.5	5.3	3.0	33.3	
Absolute difference	0	.6	.1	1.4	2.6	1.5	.2	1.2	.3	2.3	
<u>Tape 64</u> <u>Ruhl</u>											.87
(499 total tallies)	0	.2	8.0	16.0	50.9	.4	.2	9.0	4.8	10.4	
Matthews (495 total tallies)	0	.4	9.7	17.2	48.7	.2	1.0	9.9	4.4	8.5	
Absolute difference	0	.2	1.7	1.2	2.2	.2	.8	.9	.4	1.9	

TABLE 9 (cont'd.)

	1	2	3	4	5	6	7	8	9	10	Reliability
<u>Percent of Tallies in Category</u>											
<u>Tape 63</u>											.64
<u>Ruhl*</u>											
(503 total tallies)	0	0	1.2	2.2	75.1	1.4	0	2.4	7.8	9.9	
Matthews**											
(490 total tallies)	0	0	1.2	2.0	81.2	1.2	0	1.6	8.4	4.3	
Absolute difference	0	0	0	.2	6.1	.2	0	.8	.6	5.6	
<u>Tape 43</u>											.88
<u>Ruhl</u>											
(408 total tallies)	0	0	12.5	17.4	30.1	4.7	.2	16.7	6.4	12.0	
Matthews											
(402 total tallies)	0	.2	10.4	19.4	30.1	5.5	1.2	17.7	4.7	10.7	
Absolute difference	0	.2	2.1	2.0	0	.8	1.0	1.0	1.7	1.3	

*Observer for experimental group..

**Observer for control group.

difference of 5.6% in category 10 and 6.3% in category 5 (if one category is high, one or more categories must, of necessity, be low). The differences in the other categories were all less than 1%. A conference with Matthews resolved this coding problem.

Intra-observer reliability was assessed during the rechecking of the tapes. As the tapes were recorded for accuracy, they were numbered. Every time the observer reviewed ten tapes, one tape was randomly selected from those previously recoded and a 12-20 minute portion was rechecked. The results of these stability checks are shown in Table 10.

Although four of the tapes have reliability less than .80, this should not cause undue concern. A perusal of Table 10 will reveal that very small percentage differences in each category will result in a disturbing decrease in reliability. This is an example of Flanders' reference to sensitivity of the Scott coefficient at higher reliabilities. For example, the greatest difference in reliability check 11 is 3.7% (category 5). Yet, the reliability coefficient is only .74.

Because of the method used in checking reliability, small differences were almost inevitable. The recoding was done with the benefit of the original (live) codings and anecdotal notes. This was of great benefit in interpreting questionable portions of the discourse. The reliability checks, however, were made from the recordings only and all interpretations were made from the recorded voice. Student talk is particularly difficult to code properly without "presence" in the classroom situation as provided by the notes and original codings.

In summary, the reliability checks reveal quite satisfactory Scott coefficients. The four that are lower than desired are not unexpected and, in fact, do not represent extreme differences in coding when one considers the method used for these checks. Finally, one observes that the lower reliability checks are not "grouped," but are distributed throughout the series of checks. Stability remains high with these exceptions. Thus, one might attribute these decreases to discourse that was particularly difficult to code without benefit of "presence" in the classroom or anecdotal notes.

TABLE 10

INTRA-OBSERVER RELIABILITY

Reliability Check Number	1	2	3	4	5	6	7	8	9	10	Reli- ability
<u>1</u>											.73
Original tallies(596)	0	.2	3.5	6.2	38.9	4.4	0	29.2	3.0	14.6	
Recorded tallies(561)	0	0	.4	4.3	48.5	2.0	0	29.1	1.4	14.4	
Difference	0	.2	3.1	1.9	9.6	2.4	0	.1	1.6	.2	
<u>2</u>											.83
Original tallies(380)	0	0	0	1.1	51.6	3.4	1.1	1.1	17.1	24.7	
Recorded tallies(353)	0	0	.3	.6	48.2	2.8	1.1	.3	16.7	30.0	
Difference	0	0	.3	.5	3.4	.6	0	.8	.4	5.3	
<u>3</u>											.85
Original tallies(446)	0	0	5.4	13.2	28.9	.4	2.9	10.3	15.5	23.3	
Recorded tallies(433)	0	.2	5.5	12.9	30.7	.9	1.8	13.6	10.9	23.3	
Difference	0	.2	.1	.3	1.8	.5	1.1	3.3	4.6	0	
<u>4</u>											.83
Original tallies(515)	0	.6	4.7	16.7	39.2	.6	1.6	13.0	7.8	15.9	
Recorded tallies(523)	0	0	4.0	16.1	40.9	1.5	1.3	8.4	8.0	19.7	
Difference	0	.6	.7	.6	1.7	.9	.3	4.6	.2	3.8	

TABLE 10 (cont'd.)

Reliability Check Number	1	2	3	4	5	6	7	8	9	10	Reli- ability
<u>5</u> Original tallies (307) Recorded tallies (306) Differences	0	.7	11.7	16.3	32.9	1.3	0	16.3	14.3	6.5	.64
	0	0	15.0	17.3	29.4	0	0	24.8	5.2	8.2	
	0	.7	3.3	1.0	3.5	1.3	0	8.5	9.1	1.7	
<u>6</u> Original tallies (397) Recorded tallies (387) Differences	0	0	8.8	15.4	37.5	2.5	.8	17.4	2.8	14.9	.80
	0	0	8.3	13.2	37.7	1.8	.5	13.2	7.8	17.6	
	0	0	.5	2.2	.2	.7	.3	4.2	5.0	2.7	
<u>7</u> Original tallies (303) Recorded tallies (305) Differences	0	.3	4.3	17.5	58.7	0	0	6.3	.7	12.2	.86
	0	.3	4.3	16.1	62.3	0	0	6.9	.3	9.8	
	0	0	0	1.4	3.6	0	0	.6	.4	2.4	
<u>8</u> Original tallies (243) Recorded tallies (254) Difference	0	0	3.3	11.1	56.0	.8	0	7.0	7.8	14.0	.86
	0	0	5.5	12.6	54.3	.4	0	6.3	8.7	12.2	
	0	0	2.2	1.5	1.7	.4	0	.7	.9	1.8	

TABLE 10 (cont'd.)

Reliability	1	2	3	4	5	6	7	8	9	10	Reli- ability
Check Number											
<u>9</u>											
Original tallies (273)	0	0	0	1.1	86.1	0	0	.4	2.9	9.5	.80
Recorded tallies (276)	0	0	.4	1.4	83.3	0	.7	.4	2.9	10.9	
Difference	0	0	.4	.3	2.8	0	.7	0	0	1.4	
<u>10</u>											
Original tallies (284)	0	0	8.8	12.3	56.0	0	0	10.2	1.8	13.9	.96
Recorded tallies (298)	0	0	9.1	12.8	55.0	.3	0	10.4	1.3	11.1	
Difference	0	0	.3	.5	1.0	.3	0	.2	.5	2.8	
<u>11</u>											
Original tallies (281)	0	0	1.1	5.3	81.1	.7	0	2.1	1.1	8.5	.74
Recorded tallies (290)	0	0	1.0	4.8	84.8	.7	0	1.7	1.4	5.5	
Difference	0	0	.1	.5	3.7	0	0	.4	.3	3.9	
<u>12</u>											
Original tallies (311)	0	0	0	9.6	40.8	3.9	0	1.0	4.2	40.5	.84
Recorded tallies (322)	0	0	0	11.8	43.8	2.8	.3	.6	4.0	36.6	
Difference	0	0	0	2.2	3.0	1.1	.3	.4	.2	3.9	
<u>13</u>											
Original tallies (241)	0	0	7.1	22.0	27.0	2.5	0	11.6	4.6	25.3	.79
Recorded tallies (266)	0	0	9.4	18.8	31.6	1.1	0	11.7	6.0	21.4	
Differences	0	0	2.3	3.2	4.6	1.4	0	.1	1.4	3.9	

Observation of the Sample

Observational Procedure

In order to obtain as much information as possible, live coding was performed in the classroom and audio tapes were made at the same time. The observer worked out a system of short notes above the coding combined with tapping the microphone to permit later checks of the coding. All tapes were then replayed and the coding checked using the notes and the audible tapping sounds to increase accuracy of coding.

The tape recorder used was of the portable battery type and was carried within a briefcase. The microphone was mounted outside in a cloth covering that matched the case and was barely visible unless one looked for it. Although the student teachers and the cooperating teachers were fully aware that the classes were taped, the pupils were not told of this. The only reason for not telling the pupils of the recording taking place was to minimize unnatural behavior. Finally, to decrease, as much as possible, any effect on the natural behavior of the class, the observer made a point of being in the classroom before the class entered and sat in the back of the classroom. With these precautions, it is the author's opinion that the observed behavior is representative of the "normal" classroom behavior taking place without observers present.

Types of Classes Observed

Since only two classes were observed at each phase, it was necessary to observe classes that would give as much categorizable material as possible. Therefore, classes consisting primarily of laboratory, small group work, pupil reports, movies, filmstrips, or field trips were excluded from the observations. The student teachers, however, were not told which classes were to be observed.

It is the practice at Cornell University for student teachers to submit a schedule at the beginning of each week outlining the teaching plan for the week. These schedules were used to determine which classes would be observed. With the exception of exclusions mentioned above, all classes were acceptable for obser-

vation and were selected on the basis of scheduling needs. Observational convenience was a secondary concern and played no part in the selection until scheduling demands were met.

Observation Schedule

Observation of the student teachers was conducted in three phases which were distributed throughout the student teaching experience:

1. The beginning of the student teaching experience was labeled "phase one." Observations were made as soon as possible after the student teacher began actually teaching the class. In most cases, this was early in the second week of teaching. Training in interaction analysis (the experimental variable) was delayed until this first phase of observations was completed.
2. The middle of the student teaching experience was defined as "phase two." This phase of observations began immediately after the second seminar in interaction analysis.
3. Phase three was as near the end of the student teaching experience as possible. In most cases, phase three observations were made during the final week of student teaching.

For each phase, two observations per student teacher were obtained. This resulted in six observations for each student teacher (Table 11). In certain cases, an extra observation or two were made because of unusually short classes (school functions sometimes reduce the class period), or because too much of the class was devoted to laboratory or other non-categorizable behavior when using the Flanders System.

It should also be noted that scheduling difficulties necessitated the elimination of phase two for teacher number four. To have included a phase two, for this particular teacher, would have resulted in a time lapse between phases considerably shorter than those of the other student teachers. For this reason, it was decided to eliminate phase two for that teacher. Phase three for teacher number eight was also eliminated because the class

TABLE 11

SCHEDULE OF OBSERVATIONS FOR THE STUDENT TEACHERS IN
THE EXPERIMENTAL GROUP

Student Teacher	Phase 1	Phase 2	Phase 3
1	10/7/65 10/20/65	11/16/65 11/23/65	12/1/65 12/3/65 12/9/65
2	10/6/65 10/7/65	11/18/65 11/16/65	11/29/65 12/3/65
3	10/6/65 10/8/65	11/9/65 11/18/65	11/29/65 12/3/65
4	10/21/65 10/22/65		11/29/65 11/30/65 12/3/65 12/16/65
5	10/14/65 10/21/65	11/12/65 11/16/65	11/30/65 12/1/65 12/2/65
6	10/8/65 10/11/65	11/10/65 11/12/65	11/30/65 12/2/65
7	10/13/65 10/14/65 10/15/65	11/9/65 11/10/65	12/1/65 12/2/65 12/6/65
8	10/21/65 10/22/65	11/8/65 11/9/65	
9	10/19/65 10/21/65	11/30/65 12/2/65	12/9/65 12/16/65
10	10/13/65 10/15/65	11/8/65 11/10/65	11/29/65 12/3/65
11	10/18/65 10/26/65	11/12/65 11/16/65	11/30/65 12/9/65
12	11/8/65 11/15/65	11/22/65	12/1/65 12/2/65 12/6/65 12/8/65

was returned to the cooperating teacher with insufficient notice. The total amount of information is not, however, reduced markedly by these exclusions.

After the student teachers had completed their student teaching experience and returned to Cornell, each cooperating teacher was then observed six times, teaching the same group of students as had been taught by the student teacher. Since the cooperating teachers were assumed to have a stable pattern of teaching, there was no reason to observe them in phases, as was done for the student teachers.

The same observational procedure was used with the cooperating teachers as with the student teachers, with the exception of the phasing. It was also not feasible to ask them to submit a schedule as did their student teachers, so the selection of classes observed was truly random. They did not know when we would be entering the class for the observation. Because of this, it was necessary to repeat several observations that involved a type of class that was excluded from this study.

Training the Student Teachers

Introduction

It has already been pointed out that the experimental variable was training in the use of the Flanders System of Interaction Analysis. Both groups had previously experienced similar courses in teaching methods that did not include such training.

The student teachers at Cornell University are required to attend concurrent seminars while engaged in student teaching. The number of seminars remains flexible and has varied considerably from year to year. The control group had only two such seminars in which they discussed their mutual problems of teaching--discipline problems, etc. The experimental group met for five weekly seminars in which the major topic was the Flanders System of Interaction Analysis. The total time devoted to the study of interaction analysis was approximately ten hours.

Training Procedure

The training program was not designed to produce

observers of high reliability. It was the author's opinion that student teachers would gain little from emphasis on observer agreement. Instead, emphasis was placed on realizing that it was possible to describe verbal behavior--at least in selected aspects. Further, emphasis was placed on analyzing the Flanders matrix and discussing various patterns one might use to elicit certain pupil behaviors. Finally, attempts were made to help the student teachers learn how to vary their own teaching patterns to more closely conform to their intentions. No value judgments were made by the instructor concerning "good" or "bad" teaching patterns. The individual student teachers were the sole judges of which patterns of behavior were most appropriate to a given learning situation.

The first seminar began with an introduction to the topic of interaction analysis and a discussion of the possible teacher benefits to be achieved from a knowledge of the technique. The first two filmstrips produced by Flanders (1963a) were used to assist in the presentation. The last part of the seminar was devoted to coding a short two minute teaching session (taken from tape number five of the Flanders' series) followed by tabulation of the sequence into a matrix. This coding was done by the instructor on an overhead projector with the class observing. Blank matrices were then given to the student teachers and the entire class tabulated the matrix. Although this matrix represented only two minutes of discourse, it prompted considerable discussion from the class concerning the similarities between what we could infer from the matrix and what actually took place on the tape.

At the close of the first session, the student teachers were told that the seminars would probably consist of training in interaction analysis and that they would be observed and categorized by means of the system. They were offered the opportunity to suggest changes in the seminars or even discontinue the study of interaction analysis, but the class expressed considerable interest in continuing the study.

The third and fourth seminars consisted of further practice in coding verbal interaction and matrix interpretation. In addition to coding tapes, the instructor and volunteers from the class taught five minute sessions in which attempts were made to display certain patterns (known only to the person teaching). Subsequent analysis

of the matrix permitted the class to analyze the teaching in detail and compare their analysis with the stated goals of the "teacher." It is the author's opinion that this "play acting" was the most valuable part of the training--it not only provoked considerable discussion but emphasized the point that our teaching is not always what we think it is.

The final seminar consisted of small group work in which one member of the group would randomly draw a card on which was typed a series of four or five numbers (Flanders Categories), and then try to produce the verbal patterns suggested by the sequence. One of the other members, who did not enter into the discourse, would then attempt to code the verbal interaction and compare the coding with the sequence that was drawn. Each member of the group tried this several times. The purpose of this activity was to develop the skill of controlling one's verbal patterns.

Student teacher's perception on the training

After the student teaching experience had ended and they had returned to the Cornell campus, a questionnaire (based on the Post Meeting Reaction Sheet; Flanders; 1963a) was completed by the student teachers (Appendix B). A summary of the student teachers' perception of the training is presented in Tables 12a and 12b.

The student teachers rated role playing, lectures and talks by the instructor, and group discussions as the most valuable activities of the training seminars (median = 6). Their perception of the potential value of such training in helping them with their teaching was, however, rated only slightly above poor (median = 3). The lowest rating (median = 2) was given to self-experimentation with the technique.

Table 12^b reveals that the students perceived the seminars as tending to be theoretical (median = 6), but would have preferred a more practical approach (median = 3). They saw the class management as largely instructor directed (item 2, median = 9; item 5, median = 7; and item 7, median = 6), but would have preferred more student control (item 2, median = 4; item 5, median = 5; item 7, median = 4). Although the class moved more slowly (median = 3) than most of them would have preferred (median = 6), the student

TABLE 12a

STUDENT PERCEPTION OF THE VALUE OF SELECTED ASPECTS
OF THE TRAINING IN INTERACTION ANALYSIS

Activity	Rating ¹	
	Median	Range
1. Role playing	6	3- 8
2. Filmstrips or tape recordings	4	0- 8
3. Lectures and talks given by the instructor	6	4- 7
4. Group discussions that were part of the regular session	6	3- 8
5. Discussions with fellow teachers about interaction analysis	4	0-10
6. Your own experimentation in the classroom based on these classes	2	0- 7
7. Compared with an average education course, I would rate these classes	4	2- 7
8. Rate the experiences in terms of helping with own teaching as:	3	2- 7

¹Rating based on a scale from 0 to 10. A 10 means "outstanding" while a zero is reserved for "no evidence."

TABLE 12b

STUDENTS' PERCEPTION OF THE CLASS MANAGEMENT DURING THE SEMINARS ON INTERACTION ANALYSIS

Question	Rating ¹			
	Class management as the students perceived it		Type of management students would have preferred	
	Median	Range	Median	Range
1. Were the sessions theoretical (10) or practical (1)	6	1-10	3	1- 4
2. Approach from instructor (10) or student teacher	9	7-10	4	1- 9
3. Was content (10) or attitudes (1) emphasized	7	5- 9	7	4-10
4. Did the class move too fast (10) or too slow (1)	3	2- 6	6	5- 9
5. Was class instructor directed (10) or student teacher directed (1)	7	3-10	5	3- 8
6. Relationship with instructor formal (10) or informal (1)	3	1- 6	3	2- 6
7. Motivation come from instructor (10) or self (1)	6	2-10	4	1- 5

TABLE 12 (cont'd.)

Question	Rating ¹			
	Class management as the students perceived it		Type of management students would have preferred	
	Median	Range	Median	Range
8. Did you feel free (1) or restricted (10)	1	1-4	1	1-4
9. Progress due to instruction (10) or self-deter- mination (1)	5	1-10	5	2-7

¹Ratings range from one to ten.

teachers felt that the content (item 3), informality (items 6 and 8), and the progress motivation (item 9) were aspects of the seminars that coincided closely with their preferences.

During the seminars, interest and progress appeared high. The questionnaire completed after the training, however, indicated that the student teachers did not perceive this training as really helpful to them in their own teaching situation. This result does not correspond to the findings of Amidon and Simon (1965).

Informal discussion with the student teachers after the student teaching experience, combined with comments written on the questionnaire, afforded some insight to the generally negative attitude held by the student teachers for this training. First, these seminars were held at the only time possible for all teachers to assemble--immediately after school for two hours. This made a very long day for someone just beginning to teach and who would still have preparation duties to perform after the close of the seminar. Second, the student teachers resented, somewhat, the extra number of seminar hours imposed on them compared with those required of the preceding student teacher groups.

If this training is to receive greater acceptance by the student teacher, it must be made more palatable. If this training were to become a regular part of the student teaching experience, there would be less resentment toward it. It would also be helpful to find released time during the day for these seminars so that the fatigue problem would be less prevalent. In the author's opinion, a more constructive attitude would greatly increase the use that student teachers would make of the technique of interaction analysis (Table 12a, item 6) and increase their opinion of its value (Table 12a, item 8).

A matrix view of the seminars

Since the student teachers were trained in interaction analysis and observed by means of the technique, the author felt that it would be worthwhile to categorize the student teaching seminars by means of the Flanders System of Interaction Analysis.

Three of the five sessions, which were not devoted

primarily to filmstrips and audio tapes, were taped and the tapes coded by the same observer that observed the student teachers. This data furnished the basis for the matrix in Table 13.

Although it is not the purpose of this study to examine, in detail, the verbal interaction that took place in the student teaching seminars, a somewhat limited interpretation of the matrix will help to clarify the teaching approach that was used.

The selected scores presented in Table 14 (see Appendix C for the complete list of scores) reveal that the student teachers, in general, were justified in their analysis of the seminars as largely teacher directed. In particular, area A is considerably lower than the author would have wished. It can be seen that the student teachers and the cooperating teachers far exceeded the author's use of this area of "constructive integration." Student response was also more limited in the seminars than in either the cooperating teachers' classes or those of the student teachers. Student initiated talk, however, was considerably greater in the seminars than in the student teachers' classes or in the cooperating teachers' classes.

While teacher talk was somewhat lower in the seminars than in the other classes compared, the emphasis on content was nearly the same. The indirect-direct aspects of the classes can be assessed in terms of the various measures of I/I+D. The low I/I+D score for the seminars reflects the lower teacher talk percentage. This interpretation is based on the higher Revised I/I+D score for the seminars. Perhaps the most sensitive measure of indirect-direct teaching is the Row 8-9 I/I+D. This measure shows the seminars considerably more direct than either the cooperating teachers or the student teachers. This score would indicate that student talk in the seminars was usually followed by direct (categories 5-7) teacher comments rather than indirect (categories 1-4).

Finally, the use of the categories in the "vicious circle" were used equally by the author and the cooperating teachers, while the student teachers used these categories over twice as often. A perusal of the matrices (Appendix D, Tables 3 and 4) for each, however, would reveal that the use of the 6-7 and 7-6 cells is virtually nonexistent for the seminars and for the student teachers. These two cells for the cooperating teacher, accounted for 92%

TABLE 13

SUMMED MATRIX¹ REPRESENTING THE STUDENT TEACHING SEMINARS
IN INTERACTION ANALYSIS

Category	1	2	3	4	5	6	7	8	9	10
1. T accepts Feeling	0	0	0	0	0	0	0	0	0	0
2. T Praises	0	0	0	0	1	0	0	2	15	0
3. T Accepts	0	0	2	5	34	0	0	0	11	3
4. T Asks Questions	0	0	0	23	14	1	0	46	21	25
5. T Lectures	0	0	4	57	1067	2	0	1	166	102
6. T Gives Directions	0	0	0	1	3	17	0	0	1	0
7. T Gives Criticism	0	0	0	0	0	0	0	0	0	0
8. S Talk-- Response	0	2	12	4	21	1	0	3	2	8
9. S Talk-- Initiated	0	16	36	23	150	1	0	0	281	93
10. Silence-- Confusion	0	0	1	17	109	0	0	1	103	69
Total	0	18	55	130	1399	22	0	53	600	300
Percent	0	.7	2.1	5.0	54.3	.9	0	2.1	23.3	11.6

¹Total number of tallies = 2,577.

TABLE 14

SELECTED ASPECTS OF VERBAL INTERACTION EXPRESSED AS PERCENTAGES COMPARED TO THOSE PERCENTAGES OBTAINED BY THE COOPERATING TEACHERS AND THE STUDENT TEACHERS AT PHASE THREE

Score	Seminar	Coop T	S T at phase 3
T accepts feeling	0.7	0.1	0.1
T praise and encouragement	2.1	3.3	5.6
Area A	0.12	0.4	1.77
S response	2.1	7.4	9.1
S initiated	23.3	6.4	8.9
T talk	71.32	83.86	78.60
Content	59.33	66.59	57.12
I/I+D	12.5	17.63	23.13
Revised I/I+D	76.84	63.12	64.12
Row 8-9 I/I+D	34.96	52.97	57.14
Vicious Circle	1.05	1.05	2.34

of the tallies in the "vicious circle."

In conclusion, the author sought to teach the class in an indirect manner. He sought to encourage student participation as much as possible. It is apparent that these goals were not reached. In particular, the unexpected low Row 8-9 I/I+D percentage is disappointing. This, however, is the very purpose of such a matrix--to provide a "mirror" in which we can "see" our shortcomings and, hopefully, modify them.

Summary of Procedures

Twelve student teachers in secondary science were observed for a total of six class hours--twice near the beginning, twice near the middle, and twice near the end of their student teaching experience. Magnetic tape recordings were made at each observation and the verbal interaction was categorized using the Flanders System of Interaction Analysis. Six class hours of the cooperating teachers' verbal interaction were also obtained and analyzed using the same technique. A total verbal interaction matrix was constructed and fifty-nine interaction scores computed for each student teacher at each phase (beginning, middle, and end) of the observation schedule. The same was done for the cooperating teachers, for total only.

After the first phase of observations had been completed, the student teachers began training in the Flanders System of Interaction Analysis concurrently with their student teaching experience. Although they understood, during the second and third phases of the observational schedule, that the observer was using the Flanders System of Interaction Analysis to categorize their verbal behavior, they did not know what behavior was expected of them. Further, extreme caution was used during the training sessions (in interaction analysis) to avoid any value judgments concerning "good" or "bad" patterns of teaching.

A control group of eighteen student teachers and their cooperating teachers was observed in the same way. They did not, however, receive training in interaction analysis--the experimental variable.

Analysis

Data Processing

After the observations were completed and the coding checked, the raw data (sequences of numbers) were transferred to computer cards and processed by the Control Data 1604 computer at Cornell University. Four different programs were used to process the data.

First, the Wightman (1965) program as modified by Iwan (1965) was used to plot the data into matrices and compute the 59 scores selected for this study. In addition, the original program developed by Wightman was used to compute the Scott coefficients of reliability. These programs permit one to obtain matrices and scores for individual observations and combine up to ninety-nine matrices into sets with all scores computed for the sets. Further, these sets (up to ninety-nine) can be combined into a grand matrix and all scores computed for the grand matrix. In this way, it was possible to group the student teachers at phase one, for example, and obtain a grand matrix for all student teachers at phase one as well as matrices for each individual student teacher. This was done for each phase. All scores were computed for each individual teacher at each phase (Appendix E), and then a grand matrix (Appendix D) for each phase was plotted. The six observations for each cooperating teacher were combined into a set to yield a grand matrix (Appendix D) for all cooperating teachers.

The 59 scores obtained for each student teacher at each phase, and for each cooperating teacher, were then analyzed for non-random changes within the experimental and control groups using the Iwan (1965) program for the Friedman Two-Way Analysis of Variance by Ranks test. These same scores were compared between the groups by means of the Iwan (1966) program for the Mann-Whitney U test. Non-random changes related to the verbal patterns of the cooperating teachers were also identified in each group and compared between groups using the Friedman and Mann-Whitney programs respectively.

It was noted earlier that data at phase two and three could not be obtained for teacher number four and teacher number eight respectively. For each of the 59

scores, the means of all teachers at phase two and phase three were substituted for the missing data at phase two and phase three respectively. This reduced the variance of the distribution.

Statistical Techniques Employed

Non-parametric tests were used throughout the analysis of this data. The reasons for using non-parametric rather than the more familiar parametric statistical techniques are:

1. The observations were almost certainly not drawn from a normally distributed population. The assumption of a normally distributed population is basic to the use of parametric tests and one which the author was not ready to make. Further, the sample sizes ($n_1 = 12$, and $n_2 = 18$) are rather small to justify reliance on the central limit theorem.
2. The variables considered (the 59 percentages computed) are not likely to be measured on an interval scale. They are almost certainly measurable on an ordinal scale. For example, it is unlikely that a linear relationship exists between the scores for different teachers. It is reasonable, however, to assume that a teacher with an I/I+D score of .60 is more indirect than one who has a score of .30.
3. The particular statistical tests used compare very favorably with their parametric counterparts in their ability to reject the null hypothesis when it is, in fact, false (power).

To determine non-random changes within either the experimental or control group, the Friedman Two-Way Analysis of Variance by Ranks test was used (Siegel, 1956; page 166). Although the power-efficiency of this test has not been determined, its power, according to Siegel, is very close to the power of its parametric counterpart--the F test.

To perform this test, the data are cast in a two-way table having N rows and k columns. In this study, the rows represent the student teachers and the columns represent the scores obtained at the different phases. The scores in each

row are then ranked with a one assigned to the lowest, a two to the next, and so forth. If the changes within a row are truly random, the distribution of ranks in each column would be random and the sum of the ranks in each column would be nearly equal. The Friedman test determines whether these column totals differ significantly.

After ranking the scores in each row, the columns are totaled and χ_r^2 is computed according to the formula:

$$\chi_r^2 = \frac{12}{Nk(k+1)} \sum_{j=1}^k (R_j)^2 - 3N(k+1)$$

where N = number of rows

k = number of columns

R_j = sum of ranks in j^{th} column

For samples as large as 9, χ_r^2 is distributed approximately as Chi-square with $df = k-1$. A program developed by Iwan (1965) was employed to compute the Friedman test.

A two-tailed Mann-Whitney U test (Siegel, 1956; page 116) was used to compare scores between the experimental and control groups. This is a test of the null hypothesis that two groups have the same distribution, and is the non-parametric alternative to the t test. The power-efficiency of the Mann-Whitney U test is about 95%.

To compute U, for two samples of size n_1 and n_2 , the scores representing n_1 and n_2 are grouped and ranked together, keeping track of the ranks that belong to each sample. U is then found by:

$$U = n_1 n_2 + \frac{n_1 (n_1 + 1)}{2} - R_1$$

where n_1 and n_2 are the sizes of the two samples and R_1 is the sum of the ranks assigned to n_1 . A different value for U (U') would be found by using n_2 and R_2 . U' can also be found by

$$U' = n_1 n_2 - U$$

The smaller of the two values of U is then compared to a known sampling distribution of U for the sample sizes considered.

Identification of Non-Random Changes for All Student Teachers

To identify the non-random changes that took place during the student teaching experience, the 59 selected aspects of verbal interaction were subjected to the Friedman Two-Way Analysis of Variance by Ranks test. Although one is primarily interested in the overall change that takes place, it is of interest to study the data for the period of maximum change. For this reason, the analysis was carried out in three ways.

First, the scores were analyzed for changes from phase one to phase two. This period will be referred to as the first half of the student teaching experience. They were then tested for non-random change from phase two to phase three--the second half of the student teaching experience.

Finally, they were analyzed for non-random changes over the entire student teaching experience--phase one to phase three.

The scores were cast in a two-way table having n rows and two columns where n was 12 for the experimental group and 18 for the control group. The two columns represented the scores obtained at the two different phases considered. A sample computation is shown in table 15.

"Extreme" Group Analysis

If the cooperating teacher does, indeed, have an effect on the student teacher's acquisition of verbal patterns, one might suppose that cooperating teachers who display "extreme" verbal patterns would have a greater effect than do their more "average" colleagues. Since the Flanders system is concerned with directness (or indirectness) of teaching, a logical measure for determining these "extreme" cooperating teachers would be some score that is particularly related to the directness of teaching. For this reason, the revised I/I+D percentage was arbitrarily selected to identify the one-third most direct cooperating teachers. The student teachers of these cooperating

TABLE 15

CHANGE IN STUDENT RESPONSE IN THE EXPERIMENTAL GROUP
FROM PHASE ONE TO PHASE TWO

Teacher	Score		Rank	
	Phase one	Phase two	Phase one	Phase 2
1	4.54	3.60	2	1
2	8.11	11.46	1	2
3	9.43	6.48	2	1
4	18.98	7.00	2	1
5	28.46	9.48	2	1
6	13.84	6.44	2	1
7	9.09	3.80	2	1
8	10.79	6.55	2	1
9	18.95	12.63	2	1
10	16.82	3.30	2	1
11	11.04	4.78	2	1
12	4.16	5.05	1	2

$$N = 12; k = 2$$

$$R_1 = 22; R_2 = 14$$

$$\chi^2_r = \frac{12}{12 \times 2 \times 3} [(22)^2 + (14)^2] - 3 \times 12 \times 3$$

$$\chi^2_r = \frac{680}{6} - 108 = 5.33$$

$$P = .05$$

teachers were then defined as the "Direct Cooperating Teacher" group, referred to hereafter as the "DCT" group.

In a similar way, the one-third most indirect cooperating teachers were identified, based on their revised I/I+D percentages. They, and their student teachers, were defined as the "Indirect Cooperating Teacher" group, referred to hereafter as the "ICT" group.

Because of the small sample sizes in the "extreme" groups (four and six for the experimental and control groups, respectively), all three phases are compared simultaneously for non-random change. Some caution must be exercised when interpreting overall change detected in this way lest this change represent only vacillations. For example, a median score could drop from .80 at phase one to .30 at phase two and then increase to .60 at phase three. The rank totals could reflect a non-random change in the first half of student teaching as well as a change during the second half. If the change over all three phases were significant, it would be difficult to determine whether the change during the first half, the second half, or the overall change accounted for this significance. In the example given, it is entirely possible that the overall change is not significant at all! If one is mindful of the possibility of such an error, there is much information to be gleaned from an analysis such as this. To include as much meaningful information as possible, and yet fully inform the reader of the possibility that a reported significant change does not represent a significant overall change, the author will take care to point out those changes which are not constant in direction.

Changes Related to the Cooperating Teacher

The Friedman test was also employed to determine the possible relationships between the changes in the verbal patterns of student teachers and the verbal patterns of their cooperating teachers. For this test, the absolute difference between each student teacher's score and the corresponding score of his cooperating teacher was determined. This difference was defined as the proximity score. These proximity scores, then, became the scores subjected to the Friedman test. They were ranked and the Chi-square value computed in exactly the same way as were the original scores.

The absolute difference was used, rather than the algebraic difference, to avoid detecting non-random changes

in proximity which, in fact, did not result in the student teacher's moving any closer to his cooperating teacher. For example, it is possible for a student teacher to begin teaching with a score on a particular variable that lies X units below the corresponding score of his cooperating teacher. At the end of the student teaching period, this score for the student teacher may lie X units above his cooperating teacher's score. The use of the algebraic difference could result in the detection of a significant non-random change which, in fact, resulted in the student teacher moving just as far away from his cooperating teacher at the end of student teaching as he was at the beginning (although in different directions). Since the absolute difference would be the same in each case, there is no danger of this change being found significant. Thus the use of absolute differences will result in detection of only those changes which result in the student teacher moving closer to (or further away from) the verbal patterns of his cooperating teacher.

It is also quite possible, when computing the probability of changes related to the cooperating teacher, to detect a non-random change related to the cooperating teacher when the raw scores (the scores obtained by each student teacher at each phase) exhibit quite random change. To illustrate this, Table 21 presents the data for the experimental group for the variable "extended student initiated talk." It can be seen that the scores at phase one and phase two exhibit random change--i.e., for every score that increases from phase one to phase two, a score decreases. This is reflected in the equal rank totals. The computed Chi-square (Friedman) for this distribution is zero and the probability (under the null hypothesis of random change) equals unity.

The difference between the score for each student teacher and his cooperating teacher, however, does not appear to be random. With the exception of teacher one and teacher nine, the difference between a student teacher's score and his cooperating teacher's score increases from phase one to phase two. The sums of the ranks in each column are quite different (22 and 14). The Chi-square (Friedman) for this distribution is 5.33 and has a probability under the null hypothesis of random change of less than .05. Thus, it can be seen that there may be changes reported with respect to the cooperating teacher when the changes within the group were quite random.

The proximity scores were analyzed for changes from

TABLE 21

SAMPLE DATA FOR CHANGE RELATED TO COOPERATING TEACHER

Variable: Extended Student Initiated Talk					
Change from Phase Two to Phase Three					
Teacher Number	Phase Two	Phase Three	Coop. Teacher	Ranks of S. T.	
				Phase One	Phase Two
1	6.16	5.82	2.84	2.0	1.0
2	2.87	2.38	5.93	2.0	1.0
3	1.50	1.02	2.56	2.0	1.0
4	3.37	4.27	1.97	1.0	2.0
5	2.90	2.43	3.17	2.0	1.0
6	1.41	1.45	.79	1.0	2.0
7	1.71	1.21	3.41	2.0	1.0
8	.40	2.86	.52	1.0	2.0
9	11.33	1.11	1.46	2.0	1.0
10	3.36	4.83	1.62	1.0	2.0
11	4.23	4.65	2.58	1.0	2.0
12	1.60	1.69	1.38	1.0	2.0

Computed Chi-square = 0

 $R_1=18$ $R_2=18$ Change in Proximity Scores from
Phase Two to Phase Three

Teacher Number	Phase Two	Phase Three	Ranks of S. T.	
			Phase One	Phase Two
1	3.32	2.98	1.0	2.0
2	3.06	3.55	2.0	1.0
3	1.06	1.54	2.0	1.0
4	1.40	2.30	2.0	1.0
5	.27	.74	2.0	1.0
6	.62	.66	2.0	1.0
7	1.70	2.20	2.0	1.0
8	.12	2.34	2.0	1.0
9	9.87	.35	1.0	2.0
10	1.74	3.21	2.0	1.0
11	1.65	2.07	2.0	1.0
12	.22	.31	2.0	1.0

 $R_1=22$ $R_2=14$

Computed Chi-square = 5.333

phase one to phase two, phase two to phase three, and phase one to phase three. This permitted the detection of changes (toward or away from the cooperating teacher) during the first half of the student teaching experience, the second half, and the entire period.

Although the change in proximity is the primary interest of this section, it is informative to report the proximity change along with the direction of change in the original score. For example, it is of interest to know that the student teachers moved toward or away from their cooperating teachers. It is also of interest to know, in addition, that this move represents an increase or decrease in the student teacher's use of the variable in question.

Comparisons of the Teaching Patterns of the Control and Experimental Groups

The preceding sections have been concerned with the identification of non-random changes that are exhibited by student teachers during the student teaching experience. It is also desirable to study the 59 variables for significant differences between the control and experimental groups. To perform this comparison, a two-tailed Mann-Whitney U test was applied to the scores obtained by the student teachers for each variable.

The null hypothesis tested was that the scores of the control group and the experimental group have the same distribution. This test was performed at each phase for each of the 59 variables for the entire sample and for the direct and indirect cooperating teacher groups.

It was pointed out in the section on ground rules that the observer for the control group recorded a maximum of four 10's between major interruptions, while the observer for the experimental group recorded a maximum of ten. This difference will not affect most of the scores. It will, however, seriously affect the amount of extended silence, and if the total silence is not too great, the percentage of total silence. For this reason, scores pertaining to extended silence and total silence have been omitted for all comparisons between groups. It should be mentioned that this did not influence the analysis pertaining to change within a group, since the same observer would have coded all observations in the same group.

Comparisons of the Changes in Teaching Patterns from Phase One to Phase Three in the Control and Experimental Groups

The purpose of this section is to compare the changes that took place in the experimental group during the student teaching experience with those that occurred in the control group. To make this comparison, an algebraic change from phase one to phase three was computed for each score, for each student teacher. These changes were then compared between groups by means of a two-tailed Mann-Whitney U test, against the null hypothesis of equal distribution in each group. Those scores pertaining to extended silence and total silence are omitted from the analysis of this section because of the different ground rules used in coding these categories.

Comparisons of the Changes in Proximity Scores from Phase One to Phase Three in the Control and Experimental Groups

The proximity score was defined earlier as the absolute difference between a student teacher's score and the corresponding score of his cooperating teacher. The change in proximity will be defined as the algebraic difference between the proximity at phase one and the proximity at phase three. Thus, if the student teacher's score is closer to that of his cooperating teacher at phase three than it was at phase one, this difference will be positive, indicating that the student teacher moved toward his cooperating teacher. These changes in proximity were compared between groups by means of a two-tailed Mann-Whitney U test against the null hypothesis of equal distribution of changes in each group.

RESULTS

Identification of Non-Random Changes in Verbal Patterns in the Entire Sample

The Chi-square values for those scores in this section for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Tables 1-3.

Phase One to Phase Two

During the first half of student teaching, the experimental group exhibited non-random changes on 13 of the 59 scores, while the control group changed significantly on only 2 (Table 16). Teacher talk in the experimental group experienced significant decreases in the amount of praise and encouragement ($p=.01$) and praise as a percentage of total teacher talk ($p=.01$). The experimental group increased their emphasis on content ($p=.05$). Teacher talk in the control group changed significantly only in decreased acceptance of student ideas ($p=.01$).

Student talk in the control group exhibited no significant change during this period. In the experimental group, however, an increase was made in student initiated talk ($p=.05$) while decreases were made in the amount of student response ($p=.05$) and the percentage of extended student response ($p=.01$).

It was possible to reject the null hypothesis of random change in only one of the scores most directly related to the indirect-direct aspects of verbal interaction. Both groups decreased their use of the area of constructive integration--area A. The experimental group showed a significant decrease at the .05 level while the control group was significant at the .01 level.

Teacher talk following student talk showed no significant changes in the control group, but the experimental group experienced significant changes on four different scores. The experimental group decreased in their use of praise following student talk ($p=.05$) and in the amount of student response following student talk ($p=.01$). Student initiated talk following student talk and the percentage of student talk that is student initiated increased ($p=.05$ for both scores).

Finally, the experimental group decreased during this period in the amount of silence following teacher praise ($p=.05$), but increased in the amount of silence following lecture. There were no significant changes in the silence scores for the control group.

TABLE 16

SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL INTER-
ACTION FROM PHASE ONE TO PHASE TWO $\alpha = 0.05$

Variable	Computed Chi-square		Significance		Phase Two Minus Phase One Difference	
	E ¹	C ²	E	C	E	C
T praise and encouragement	6.750	2.000	.01	N S	-.48	+.01
T praise T talk	6.750	2.000	.01	N S	-.85	-.02
Content	5.333	2.000	.05	N S	+5.20	+1.84
Extended T accepts ideas	.333	6.722	N S	.01	-.19	-.20
S response	5.333	2.000	.05	N S	-4.46	-.54
S initiated	5.333	2.000	.05	N S	+4.04	+.94
Extended S response	6.750	.222	.01	N S	-3.38	-.17
Area A	5.333	8.000	.05	.01	-.17	-.16
T praise following S talk	4.083	.500	.05	N S	-1.24	-.13
S response following S talk	8.333	.222	.01	N S	-17.45	+.86
S initiated following S talk	5.333	3.556	.05	N S	+9.41	+2.01
S initiated S talk	5.333	.889	.05	N S	+26.23	+2.56

TABLE 16 (cont'd.)

Variable	Computed Chi-square		Significance		Phase Two Minus Phase One Difference	
	E ¹	C ²	E	C	E	C
Silence following T praise	4.083	.500	.05	N S	-.26	0
Silence following T lecture	8.333	2.000	.01	N S	+3.80	+3.82

¹Experimental group.

²Control group.

Phase Two to Phase Three

During the second half of the student teaching experience, there were fewer non-random changes (as identified by the Friedman test) than during the first half. Table 17 shows six significant changes for the experimental group and five for the control.

The use of lecture, extended lecture, and emphasis on content decreased for the experimental group ($p=.05$ for each). Student response and extended student response showed significant increases ($p=.05$ and $.01$ respectively) during this period for the experimental group. Silence following teacher questions also increased ($p=.05$).

The control group exhibited an increase ($p=.02$) in indirect teacher response to student response (revised row 8 I/I+D). Silence following student response increased ($p=.02$) while the amount of extended silence (as a percentage of all silence) and total silence decreased ($p=.02$ and $.01$ respectively). Extended silence as a percentage of the total matrix also decreased significantly for the control group.

TABLE 17

SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL INTER-
ACTION FROM PHASE TWO TO PHASE THREE $\alpha = 0.05$

Variable	Computed Chi-square		Significance		Phase Three Minus Phase Two Difference	
	E ¹	C ²	E	C	E	C
T lectures	5.333	2.000	.05	N S	-2.05	+8.11
Content	5.333	2.000	.05	N S	-.69	+3.35
Extended T lectures	5.333	.889	.05	N S	-2.05	+6.72
S response	5.333	.889	.05	N S	+.74	-2.78
Extended S response	8.333	3.556	.01	N S	+.39	-.56
Revised Row 8 I/I+D	3.000	5.556	N S	.02	-1.83	+2.53
Silence following T questions	5.333	.222	.05	N S	+5.56	+.78
Silence following S response	1.333	5.556	N S	.02	+1.05	+.61
Extended silence/silence	1.333	5.556	N S	.02	-6.58	-1.26
Total silence	.333	8.000	N S	.01	-1.36	-3.79
Extended silence	.333	10.889	N S	.001	-1.97	-1.89

¹Experimental group.²Control group.

Phase One to Phase Three

The student teaching experience, as a whole, revealed ten significant changes (as identified by the Friedman Two-Way Analysis of Variance by Ranks test) in the experimental group compared with four in the control group (Table 18).

The experimental group decreased ($p=.01$) their use of praise following student talk, teacher praise and encouragement ($p=.01$), and teacher praise as a percentage of all teacher talk ($p=.01$). Student initiated talk following student talk, and student initiated talk as a percentage of all student talk increased in the experimental group ($p=.01$, and $.05$, respectively). Student response decreased ($p=.01$). Extended student initiated talk increased ($p=.05$), as did the emphasis on content ($p=.05$). Silence following teacher praise and total silence also decreased ($p=.05$ for both).

The control group increased their use of teacher directions following student talk ($p=.05$). Their row 8-9 I/I+D score and their use of area A decreased ($p=.02$ for both scores). The total silence in the control group also displayed a decrease over the student teaching experience ($p=.01$).

Identification of Non-Random Changes in the "Direct Cooperating Teacher" Group

The medians and ranges of the original scores are presented in Appendix E, Tables 4-6. The Chi-square values for those scores for which the null hypothesis could not be rejected at the $.05$ level are presented in Appendix F, Table 4.

In the DCT group, Table 19 reveals that the control group experienced two significant changes. Teacher questions following student talk decreased ($p=.03$), while silence following student response increased ($p=.03$).

The experimental DCT group shows two changes for the entire student teaching period that were not, however, consistent in direction. Although student initiated talk following student talk decreased for the second half of student teaching, it exhibited a net increase ($p=.04$) for the entire student teaching experience. The row 8-9 I/I+D

TABLE 18

SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL INTER-
ACTION FROM PHASE ONE TO PHASE THREE $\alpha = 0.05$

Variable	Computed Chi-square		Significance		Phase Three Minus Phase One Difference	
	E ¹	C ²	E	C	E	C
T praise following S talk	8.333	.889	.01	N S	-1.17	-.13
T directions following S talk	.333	4.500	N S	.05	+.28	-.27
S initiated/ following S talk	8.333	.889	.01	N S	+8.16	+7.53
S initiated S talk	5.333	.889	.05	N S	+16.91	+13.24
S response	8.333	.889	.01	N S	-3.72	-3.32
Extended S initiated	5.333	3.556	.05	N S	+1.45	+.95
T praise and encouragement	8.333	2.000	.01	N S	-.57	-.02
T praise/ T talk	8.333	2.000	.01	N S	-1.00	-.01
Content	5.333	3.556	.05	N S	+4.51	+5.19
Row 8-9 I/I+D	.333	5.556	N S	.02	-.34	-8.96
Area A	3.000	5.556	N S	.02	-.93	-.16
Silence following T praise	4.083	0	.05	N S	-.26	0
Total silence	5.333	8.000	.05	.01	-4.27	-4.94

¹Experimental group.²Control group.

TABLE 19

SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL INTERACTION
IN THE "DIRECT COOPERATING TEACHER" GROUP

$\alpha = 0.05$

Variable	Computed Chi-square		Significance		Difference	
	E ¹	C ²	E	C	E	C
T questions following S talk	1.500	7.000	NS	.03	P2-P1	+2.58
					P3-P2	+1.50
					P3-P1	+4.08
Silence following S response	0	7.000	NS	.03	P2-P1	-.64
					P3-P2	+.92
					P3-P1	+.28
S initiated following S talk	6.500	1.000	.04	NS	P2-P1	+14.28
					P3-P2	-6.48
					P3-P1	+7.80
Row 8-9 I/I+D	6.500	4.000	.04	NS	P2-P1	+16.56
					P3-P2	-10.21
					P3-P1	+6.35

¹Experimental group.

²Control group.

percentages also displayed a decrease during the second half of student teaching for the experimental DCT group, but this decrease was offset by a large increase during the initial half of student teaching, resulting in a net increase ($p = .04$) for the entire period.

Identification of Non-Random Changes in The "Indirect Cooperating Teacher" Group

The medians and ranges of the original scores used in this analysis are presented in Appendix E, Tables 7-9. The Chi-square values for those scores for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Table 5.

Table 20 shows that the control ICT group increased their emphasis on content ($p=.03$), while they decreased their use of area A ($p=.01$), the amount of total silence ($p=.002$), and the amount of extended silence ($p=.03$) in their classrooms. The control group also experienced a net decrease ($p=.03$) in their acceptance of student ideas, although there was a slight increase in this score during the second half of student teaching.

The experimental ICT group revealed only three non-random changes over the entire student teaching experience (Table 20). Their use of criticism and extended criticism decreased ($p=.04$ for both). Although there was a slight increase in the use of praise following student talk during the second half of student teaching, the net effect for the entire period was a decrease ($p=.04$).

Identification of Non-Random Changes in Proximity in the Entire Sample

The medians and ranges of the scores used in the analysis in this section may be found in Appendix E, Tables 1-3 and Tables 10-12. The Chi-square values for those scores in this section for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Tables 6-8.

Phase One to Phase Two

During the first half of the student teaching experience, there were four non-random changes in the experimental group and one change in the control group that were related to the cooperating teachers' verbal patterns. Table 22 reveals that the student teachers in the experimental group moved toward their cooperating teachers in all of those

TABLE 20

SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL INTERACTION
IN THE "INDIRECT COOPERATING TEACHER" GROUP $\alpha = 0.05$

Variable	Computed Chi-square		Significance		Difference		
	E ¹	C ²	E	C		E	C
Content	3.500	7.000	NS	.03	P2-P1	+7.92	+5.00
					P3-P2	+5.48	+4.50
					P3-P1	+13.40	+9.50
Extended T accepts ideas	2.000	8.333	NS	.03	P2-P1	+.27	-.57
					P3-P2	-.11	+.04
					P3-P1	+.16	-.54
Area A	.500	9.333	NS	.01	P2-P1	-.58	-1.50
					P3-P2	-.16	-.03
					P3-P1	-.74	-1.52
Total silence	3.500	10.333	NS	.002	P2-P1	-7.32	-2.63
					P3-P2	-1.29	-4.41
					P3-P1	-8.61	-6.78
Extended silence	3.500	8.333	NS	.03	P2-P1	-5.25	-.62
					P3-P2	-1.90	-2.27
					P3-P1	-5.15	-2.88
T criticism	6.500	1.750	.04	NS	P2-P1	-.59	+.08
					P3-P2	-.29	+.03
					P3-P1	-.88	+.11
T praise following S talk	6.500	4.083	.04	NS	P2-P1	-4.37	+5.50
					P3-P2	+.58	-1.50
					P3-P1	-3.79	+4.00
Extended T criticism	6.500	1.583	.04	NS	P2-P1	-.08	0
					P3-P2	-.10	+.05
					P3-P1	-.18	+.05

¹Experimental group.²Control group.

TABLE 22
SIGNIFICANT CHANGES IN PROXIMITY³ SCORES FROM PHASE ONE
TO PHASE TWO

Variable	Computed Chi-square		Significance		Proximity change + toward Coop. -away from Coop.	
	E ¹	C ²	E	C	E	C
Content	5.333	.889	.05	N S	+9.12	+1.05
Extended T accepts ideas	5.333	1.389	.05	N S	+.35	+.04
Extended S initiated	.333	6.722	N S	.01	-.58	-.26
Area A	8.333	2.000	.01	N S	+.71	+.19
Silence following T praise	4.083	.056	.05	N S	+.21	+.11

¹Experimental group ²Control group

³Absolute difference between a student teacher's score and the corresponding score of his cooperating teacher.

proximity changes that were significant at the .05 level. This tendency to become more like their cooperating teachers represents increased emphasis on content ($p=.05$), decreased extended acceptance of student ideas ($p=.05$), decreased use of area A ($p=.01$), and a decrease in the amount of silence following praise ($p=.05$).

The only non-random change in the control group that was related to the cooperating teacher was a move away

from the cooperating teachers in an increased amount of extended student initiated talk ($p = .01$).

Phase Two to Phase Three

The second half of the student teaching experience reveals only two non-random changes that are related to the cooperating teacher.

TABLE 23
SIGNIFICANT CHANGES IN PROXIMITY³ SCORES FROM PHASE TWO TO PHASE THREE

Variable	Computed Chi-square		Significance		Proximity change	
	E ¹	C ²	E	C	+ toward Coop. -away from Coop.	E C
Extended S initiated	5.333	.222	.05	N S	-.61	+.01
I/I+D	4.083	.222	.05	N S	-2.47	-1.44

¹Experimental group. ²Control group.

³Absolute difference between a student teacher's score and the corresponding score of his cooperating teacher.

Table 23 shows that both of the identified changes during the second half of student teaching were in the experimental group. In each case, the student teachers moved away ($p = .05$ for both changes) from their cooperating teachers as they decreased their I/I+D score and the amount of extended student initiated talk.

Phase One to Phase Three

During the entire student teaching period, the experimental group exhibited five non-random proximity changes, while the control group experienced none (Table 24). The experimental group increased in student initiated talk and decreased in their use of questions following student talk

TABLE 24
SIGNIFICANT CHANGES IN PROXIMITY³ SCORES FROM PHASE ONE
TO PHASE THREE

Variable	Computed Chi-square		Significance		Proximity change + toward Coop. -away from Coop.	
	E ¹	C ²	E	C	E	C
S initiated	5.333	2.000	.05	N S	-2.08	-1.49
Silence following T praise	4.083	.222	.05	N S	+.21	-.02
Extended silence	5.333	.889	.05	N S	+3.49	-.13
Content	5.333	.889	.05	N S	+7.87	-1.72
T questions following S talk	5.333	2.000	.05	N S	-.77	-.53

¹Experimental group.

²Control group.

³Absolute difference between a student teacher's score and the corresponding score of his cooperating teacher.

as they moved away ($p=.05$ for both changes) from the verbal patterns of their cooperating teachers. On the other three changes, they moved toward their cooperating teachers in decreased silence following praise ($p=.05$), decreased extended silence ($p=.05$), and increased emphasis on content ($p=.05$).

Identification of Non-Random Changes in Proximity in the
"Direct Cooperating Teacher" Group

The verbal patterns of the student teachers in the

DCT group were analyzed for non-random changes in proximity scores. Again, because of the small sample sizes, the changes are identified across all three phases and care must be exercised in the interpretation of those scores which do not exhibit directionally constant change. Those changes which are significant but are not constant in direction will be carefully explained and attention drawn to their oscillatory nature.

The medians and ranges of the scores used in the analysis in this section may be found in Appendix E, Tables 4-6 and Tables 10-12. The Chi-square values for those scores for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Table 9.

Table 25 shows that the control direct cooperating teacher group experienced only one change in which they initially moved toward, but during the second half of student teaching, moved away from their cooperating teachers. This change resulted in a net move toward ($p=.01$) their cooperating teachers as the amount of silence following teacher questions increased.

On two different measures, the experimental group moved away ($p=.04$ for both) from their cooperating teachers in their increased use of teacher criticism. They moved toward ($p=.04$) their cooperating teachers as the percentage of student initiated talk increased. This score, however, did not change in a uniform way. It initially represented a move toward their cooperating teachers as student initiated talk increased. During the second half of student teaching, they became less like their cooperating teachers as student initiated talk decreased. The net change represented a move toward their cooperating teachers in increased student initiated talk.

Identification of Non-Random Changes in Proximity in the "Indirect Cooperating Teacher" Group

The proximity scores were subjected to the same analysis in the indirect as in the direct cooperating teacher group. The medians and ranges of the scores used in the analysis in this section may be found in Appendix E, Tables 7-9 and Tables 10-12. The Chi-square values for those scores for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Table 10.

TABLE 25

SIGNIFICANT CHANGES IN PROXIMITY SCORES IN THE "DIRECT COOPERATING TEACHER" GROUP

 $\alpha = 0.05$

Variable	Computed Chi-square		Significance		Proximity change		
	E ¹	E ²	E	C	+ toward Coop. -away from Coop.	Period	C
Silence following T questions	3.500	9.333	NS	.01	+4.32 -1.41 +2.91	P1-P2 P2-P3 P1-P3	+18.46 -5.46 +13.00
T criticism	6.500	1.333	.04	NS	-.04 -.05 -.09	P1-P2 P2-P3 P1-P3	-.12 +.33 +.21
T criticism/ T talk	6.500	1.000	.04	NS	-.02 -.13 -.15	P1-P2 P2-P3 P1-P3	-.26 +.65 +.39
S initiated/ S talk	6.500	2.333	.04	NS	+13.86 -6.51 +7.35	P1-P2 P2-P3 P1-P3	+6.54 -6.69 -.15

¹Experimental group.²Control group.

The non-random changes described in Table 26 are equally divided between the control and experimental groups.

The control group initially moved toward their cooperating teachers on two measures of the use of teacher directions ($p=.01$ and $.002$) as they decreased in their use of each. Continued decreases in both of these measures resulted in a net move away from their cooperating teachers. Except for a very small decrease at phase two, they moved toward their cooperating teachers as the percentage of

TABLE 26

SIGNIFICANT CHANGES IN PROXIMITY SCORES IN THE "INDIRECT COOPERATING TEACHER" GROUP

 $\alpha = 0.05$

Variable	Computed Chi-square		Significance		Proximity change + toward Coop. -away from Coop.		
	E ¹	C ²	E	C	E	Period	C
T directions	3.500	9.333	NS	.01	+.77 -.71 +.06	P1-P2 P2-P3 P1-P3	+.52 -1.49 -.97
T directions/ T talk	1.500	10.333	NS	.002	+1.63 -.91 +.72	P1-P2 P2-P3 P1-P3	+.93 -2.03 -1.10
Silence fol- lowing T questions	3.500	9.333	NS	.01	+3.15 -6.89 -3.84	P1-P2 P2-P3 P1-P3	+8.35 -.34 +8.01
T criticism	8.000	.250	.005	NS	+.39 +.56 +.95	P1-P2 P2-P3 P1-P3	0 -.09 -.09
T criticism/ T talk	6.500	1.083	.04	NS	+.66 +1.20 +1.86	P1-P2 P2-P3 P1-P3	-.06 -.05 -.11
Extended T criticism	6.500	.250	.04	NS	+.08 +.16 +.24	P1-P2 P2-P3 P1-P3	0 -.04 -.04

¹Experimental group.²Control group.

silence following questions decreased. The experimental group moved toward their cooperating teachers as they decreased their use of criticism ($p=.005$ and $.04$) and extended criticism ($p=.04$).

Comparisons of the Teaching Patterns of the Control and Experimental Groups

The medians and ranges of the original scores used in the analysis of this section are presented in Appendix E, Tables 1-9. The Chi-square values for those scores for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Tables 11-19.

Comparisons of the teaching patterns of the entire sample

Table 27 shows that at phase one, the entire experimental and control groups differed from each other on 7 of the 59 variables. The experimental group compared with the control group used more praise following student talk ($p=.02$) and silence following acceptance of student ideas ($p=.02$). They were lower than the control group, however, in their use of: lecture ($p=.02$), teacher talk ($p=.05$), emphasis on content ($p=.002$), silence following student response ($p=.05$), and extended lecture ($p=.02$).

At phase two, 18 of the 59 variables considered were significantly different for the experimental and control groups (Table 28). The experimental group used more: acceptance of ideas ($p=.05$), acceptance of ideas as a percentage of teacher talk ($p=.02$), constructive integration--area A ($p=.002$), and extended acceptance of ideas ($p=.002$). The amount of student initiated talk, as a percentage of all student talk, was greater ($p=.05$) in the experimental group. Their greater use of indirect response following student talk is indicated by a larger: row 8-9 I/I+D percentage ($p=.02$), revised row 8 I/I+D percentage ($p=.002$), and revised row 9 I/I+D percentage ($p=.02$). The student teachers in the experimental group differed from the control group in less: emphasis on content ($p=.02$), lecture following student talk ($p=.05$), criticism following student talk ($p=.002$), student response following student talk ($p=.02$), extended use of questions ($p=.05$), extended lectures ($p=.05$), and extended student response.

TABLE 27

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL GROUPS AT PHASE ONE
 $\alpha = 0.05$

Variable	Median		Difference E-C	Min U	Signi- ficance
	E	C			
T lectures	40.41	51.77	-11.36	45.00	.02
T talk	75.53	80.19	-4.66	58.00	.05
Content	51.91	65.31	-13.40	22.00	.002
T praise fol- lowing S talk	1.69	.13	+1.56	52.50	.02
Silence following T accepts ideas	2.99	1.48	+1.51	41.00	.02
Silence following S response	3.47	7.10	-3.63	58.00	.05
Extended T lectures	29.82	40.39	-10.57	42.00	.02

¹Differences identified by the Mann-Whitney U test.

TABLE 28

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL GROUPS AT PHASE TWO $\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T accepts ideas	4.92	3.82	+1.10	59.00	.05
T accepts ideas/ T talk	7.66	5.85	+2.81	50.00	.02
Content	57.11	67.15	-10.04	39.06	.02
Area A	1.18	.15	+1.03	31.50	.002
T lectures fol- lowing S talk	22.75	30.20	-7.45	58.00	.05
T criticism fol- lowing S talk	.24	2.03	-1.79	36.00	.002
S response fol- lowing S talk	6.30	13.53	-7.23	44.00	.02
Silence following T accepts ideas	3.51	1.01	+2.50	14.00	.002
Silence following T directions	2.55	4.30	-1.75	51.00	.02
Silence following S response	2.25	6.29	-4.04	56.00	.05
Extended T accepts ideas	.76	0	+.76	29.00	.002
Extended T asks questions	1.60	2.83	-1.23	56.00	.05
Extended T lectures	36.95	45.89	-8.94	59.00	.05
Extended S response	.66	1.93	-1.27	52.00	.02
Student initiated talk/S talk	55.82	38.73	+17.09	59.00	.05

TABLE 28 (cont'd.)

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
Row 8-9 I/I+D	65.20	46.01	+16.19	42.00	.02
Revised row 8 I/I+D	98.11	90.25	+7.86	32.00	.002
Revised row 9 I/I+D	93.72	55.05	+38.67	43.00	.02

¹Differences identified by the Mann-Whitney U test.

At phase three, the control and experimental groups exhibited significant differences on 13 variables (Table 29). The student teachers of the experimental group displayed greater use of: acceptance of ideas as a percentage of teacher talk ($p=.05$), area A ($p=.002$), questions following student talk ($p=.05$), extended acceptance of ideas ($p=.002$), and indirect response after student initiated talk (revised row 9 I/I+D, $p=.02$). The experimental group had less: lecture ($p=.02$), emphasis on content ($p=.002$), criticism following student talk ($p=.02$), extended questions ($p=.05$), and extended lecture ($p=.02$). The experimental group also had more silence following teacher criticism ($p=.05$), but less following student response ($p=.002$), than did the control group. The total time devoted to steady state was less in the experimental group than in the control group ($p=.02$).

Comparisons of the Teaching Patterns of the "Direct Cooperating Teacher" Groups

Table 30 reveals that the experimental and control

TABLE 29

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL GROUP AT PHASE THREE

$\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T lectures	46.89	61.73	-14.84	40.00	.02
T accepts ideas/T talk	7.16	4.15	+3.01	56.00	.05
Content	56.42	70.50	-14.08	30.00	.002
Area A	.98	.15	+.73	31.00	.002
T questions fol- lowing S talk	10.93	6.35	+4.58	56.00	.05
T criticism fol- lowing S talk	.50	1.56	-1.06	51.00	.02
Silence following T criticism	1.88	0	+1.88	56.50	.05
Silence following S response	3.29	6.91	-3.62	36.50	.002
Extended T accepts ideas	.71	.08	+.63	25.00	.002
Extended T asks questions	1.53	2.38	-.85	59.50	.05
Extended T lectures	34.90	52.62	-17.72	41.00	.02
Revised row 9 I/I+D	93.13	62.50	+30.63	46.50	.02
Total T steady state	53.47	65.89	-12.42	49.00	.02

¹Differences identified by the Mann-Whitney U test.

direct cooperating teacher groups were very much alike at phase one. The only variable which exhibited a significant difference was the experimental group's larger amount of silence following acceptance of ideas ($p=.05$).

TABLE 30

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE CONTROL AND EXPERIMENTAL "DIRECT COOPERATING TEACHER" GROUPS AT PHASE ONE

$\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
Silence fol- lowing T accepts ideas	2.43	1.57	+.86	3.00	.05

¹Differences identified by the Mann-Whitney U test.

At phase two, Table 31 shows 12 variables that are significantly different between the control and experimental direct cooperating teacher groups. The experimental DCT group obtained higher percentages on row 8-9 I/I+D ($p=.02$), revised row 8 I/I+D ($p=.005$), and revised row 9 I/I+D ($p=.05$). They also displayed a larger amount of extended acceptance of ideas ($p=.05$) and silence following acceptance of ideas ($p=.05$). The experimental direct cooperating teacher group, however, had less: lecture following student talk ($p=.02$), directions following student talk ($p=.05$), criticism following student talk ($p=.005$), extended student response ($p=.01$), silence following teacher criticism ($p=.05$), silence following questions ($p=.02$), and student response following student talk ($p=.01$).

TABLE 31
SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL "DIRECT COOPERATING TEACHER"
GROUPS AT PHASE TWO
 $\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T lectures fol- lowing S talk	20.90	32.65	-11.75	2.00	.02
T directions following S talk	0	1.21	-1.21	2.50	.05
T criticism fol- lowing S talk	0	3.80	-3.80	0	.005
S response fol- lowing S talk	5.05	13.53	-8.48	1.00	.01
Silence following T accepts ideas	4.01	1.28	+2.73	3.00	.05
Silence following T questions	7.20	14.41	-7.21	2.00	.02
Silence following T criticism	.38	1.79	-1.41	3.50	.05
Extended T accepts ideas	.49	0	+.49	3.50	.05
Extended S response	.59	1.73	-1.14	1.00	.01
Row 8-9 I/I+D	67.00	37.08	+29.92	2.00	.02
Revised row 8 I/I+D	99.99	80.22	+19.77	0	.005
Revised row 9 I/I+D	99.99	37.50	+62.49	2.50	.05

¹Differences identified by the Mann-Whitney U test.

Table 32 reveals only two differences between the experimental and control direct cooperating teacher groups at phase three. The use of criticism is less ($p=.005$) in the experimental DCT group, and they use more indirect response to student response (revised row 8 I/I+D percentage, $p=.005$).

TABLE 32
SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL "DIRECT COOPERATING TEACHER"
GROUPS AT PHASE THREE

$\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T criticism following S talk	.39	3.36	-2.93	0	.005
Revised row 8 I/I+D	95.85	87.75	+8.10	0	.005

¹Differences identified by the Mann-Whitney U test.

Comparisons of the Teaching Patterns of the "Indirect Cooperating Teacher" Groups

In the indirect cooperating teacher group, 8 of the 59 variables reveal significant differences between the control and the experimental groups at phase one. Table 33 shows that the experimental indirect cooperating teacher group used less lecture ($p=.02$), extended lecture ($p=.02$), and teacher talk ($p=.05$) than did the corresponding control group. They also placed less emphasis on content ($p=.02$) and had less silence following student response ($p=.05$). The experimental indirect cooperating teacher group, however, used more total criticism ($p=.02$) and criticism as a percentage of all teacher talk ($p=.01$). There was also more praise following student talk ($p=.05$) in the experimental group than in the control group.

TABLE 33

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING TEACHER"
GROUPS AT PHASE ONE

$\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T lectures	30.48	47.21	-16.73	2.00	.02
T criticism	1.80	.35	+1.45	2.00	.02
T talk	72.24	80.19	-7.95	3.00	.05
T criticism/ T talk	3.41	.51	+2.90	1.00	.01
Content	40.12	61.14	-21.02	2.00	.02
T praise fol- lowing S talk	4.37	1.13	+3.24	3.00	.05
Silence fol- lowing S response	4.14	10.32	-8.91	3.00	.05
Extended T lectures	20.30	37.34	-17.04	2.00	.02

¹Differences identified by the Mann-Whitney U test.

At phase two, Table 34 shows 11 variables for which the distribution of scores were significantly different in the experimental and control indirect cooperating teacher groups.

The experimental indirect cooperating teacher group, as compared to the control, exhibited more: student initiated talk ($p=.05$), use of categories in area A ($p=.05$), silence following acceptance of ideas ($p=.05$), and extended criticism ($p=.05$). They had less: lecture ($p=.05$), teacher talk ($p=.05$), content emphasis ($p=.01$), and extended lecture ($p=.02$). Silence following directions ($p=.05$), silence

TABLE 34

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE
CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING TEACHER"
GROUPS AT PHASE TWO

$\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T lectures	34.72	51.54	-16.82	3.00	.05
T talk	75.61	81.36	-5.75	3.00	.05
S initiated	11.46	6.72	+4.74	3.00	.05
Content	48.04	66.13	-18.09	1.00	.01
Area A	.97	.24	+.73	3.00	.05
Silence following T accepts ideas	2.77	1.38	+1.39	3.00	.05
Silence following T directions	1.98	3.51	-1.53	3.00	.05
Silence following S response	1.70	8.77	-7.07	1.00	.01
Silence following S initiated	4.42	7.98	-3.56	0	.005
Extended T lectures	21.35	40.55	-19.20	2.00	.02
Extended T criticism	.20	0	+.20	3.50	.05

¹Differences identified by the Mann-Whitney U test.

following student response ($p=.01$), and silence following student initiated talk ($p=.005$) were also less prevalent in the experimental group than in the control group.

Table 35 shows 8 variables that were significantly

different in the control and experimental indirect cooperating teacher groups at phase three. The experimental indirect cooperating teacher group exhibited more: total criticism ($p=.01$), criticism as a percentage of all teacher talk ($p=.01$), silence following criticism ($p=.005$), and indirect response following student initiated talk (row 9 I/I+D, $p=.05$). They were lower than the corresponding control group in the amount of: lecture ($p=.05$), extended lecture ($p=.02$), silence following student response ($p=.02$), and extended use of all categories (steady state, $p=.05$).

TABLE 35

SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN THE CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING TEACHER" GROUPS AT PHASE THREE $\alpha = 0.05$

Variable	Median		Dif- ference E-C	Min U	Signi- ficance
	E	C			
T lectures	46.47	62.42	-15.95	3.00	.05
T criticism	.92	.46	+.46	1.00	.01
T criticism/ T talk	1.54	.58	+.96	1.00	.01
Silence following T criticism	3.03	0	+3.03	0	.005
Silence following S response	3.20	15.92	-12.72	2.00	.02
Extended T lectures	33.46	52.62	-19.16	2.00	.02
Revised row 9 I/I+D	88.36	62.50	+25.86	3.50	.05
Total T steady state	53.68	67.12	-13.44	3.00	.05

¹Differences identified by the Mann-Whitney U test.

Comparisons of the Changes in Teaching Patterns from Phase One to Phase Three in the Control and Experimental Groups

The medians and ranges of the original scores used in the analysis in this section are presented in Appendix E, Tables 1-9. The Chi-square values for those scores for which the null hypothesis could not be rejected at the .05 level are presented in Appendix F, Tables 20-22.

TABLE 36

CHANGES¹ IN VERBAL INTERACTION FROM PHASE ONE TO PHASE THREE WHICH ARE SIGNIFICANTLY DIFFERENT IN THE CONTROL AND EXPERIMENTAL GROUPS

$\alpha = .05$

Variable	Median		Min U	Significance
	E	C		
T praise and encouragement	-.50	-.03	51.50	.02
T praise/T talk	-.88	-.03	49.00	.02
T praise following S talk	-1.33	0	56.00	.05
S response following S talk	-14.07	-.66	59.00	.05
Silence following T praise	-.26	0	51.00	.02
Extended S response	-3.28	-.11	49.00	.02

¹Differences identified by the Mann-Whitney U test.

Comparisons of Changes for the Entire Sample

Table 36 shows that there were only six of the fifty-nine variables for which the experimental and control groups experienced significantly different changes over the student teaching period. The experimental group decreased in: praise and encouragement as a percentage of the total matrix ($p=.02$), praise as a percentage of teacher talk ($p=.02$), praise following student talk ($p=.05$), student response following student talk ($p=.05$), silence following teacher praise ($p=.02$), and extended student response ($p=.02$).

Comparisons of Changes in the "Direct Cooperating Teacher" Groups

There was only one change that differed significantly in the experimental and control direct cooperating teacher groups (Table 37). The experimental direct cooperating group increased ($p=.005$) their use of questions following student talk, while the corresponding control group decreased in the use of this variable.

TABLE 37

CHANGES¹ IN VERBAL INTERACTION FROM PHASE ONE TO PHASE THREE WHICH ARE SIGNIFICANTLY DIFFERENT IN THE CONTROL AND EXPERIMENTAL "DIRECT COOPERATING TEACHER" GROUPS

$$\alpha = 0.05$$

Variable	Median		Min U	Significance
	E	C		
T questions following S talk	+1.94	-4.32	0	.005

¹Differences identified by the Mann-Whitney U test.

Comparisons of Changes in the "Indirect Cooperating Teacher" Group

Table 38 shows that there were five changes in the indirect cooperating teacher groups that were significantly different. While the control and experimental indirect cooperating teacher groups both experienced decreases, the experimental group decreased more in their use of:

criticism ($p=.02$), criticism as a percentage of teacher talk ($p=.02$), praise as a percentage of teacher talk ($p=.05$), and praise following student talk ($p=.05$). They increased, however, their use of indirect response following student initiated talk (revised row 9 I/I+D, $p=.05$). The student teachers in the control group decreased in their revised row 9 I/I+D percentage.

TABLE 38

CHANGES¹ IN VERBAL INTERACTION FROM PHASE ONE TO PHASE THREE WHICH ARE SIGNIFICANTLY DIFFERENT IN THE CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING TEACHER" GROUPS

$\alpha = .05$

Variable	Median		Min U	Significance
	E	C		
T criticism	-.82	-.08	2.00	.02
T praise/T talk	-2.70	-.28	3.00	.05
T criticism/ T talk	-1.86	-.14	2.00	.02
T praise fol- lowing S talk	-3.77	-.43	3.00	.05
Revised row 9 I/I+D	+7.22	-13.69	3.00	.05

¹Differences identified by the Mann-Whitney U test.

Comparisons of the Changes in Proximity Scores from Phase One to Phase Three in the Control and Experimental Groups

The medians and ranges of the original scores used in the analysis in this section are presented in Appendix E, Tables 1-12. The Chi-square values for those scores for which the null hypothesis could not be rejected at the

.05 level are presented in Appendix F, Tables 23-25. Those scores pertaining to extended silence and total silence are omitted from the analysis in this section because of the different ground rules used in the coding of these categories.

Comparisons of Changes in Proximity for the Entire Sample

In the entire sample, changes in proximity scores were different on only three variables: content ($p=.05$), silence following teacher praise ($p=.02$), and the row 8-9 I/I+D percentage ($p=.02$). Table 39 shows that the changes in the experimental group were different from those in the control group principally in direction. Each proximity change was positive for the experimental group, while the control group moved away from their cooperating teachers, or experienced no change in relation to them.

Comparisons of Changes in Proximity in the "Direct Cooperating Teacher" Groups

The two entries listed in Table 40 again show positive changes in proximity scores for the experimental group. The control group also experienced a positive change in proximity which is much greater in magnitude than that of the experimental group. While both groups increased in the amount of student initiated talk following student talk as they moved toward ($p=.01$) their cooperating teachers, the control group increased sufficiently to move beyond their cooperating teachers and exhibit a negative proximity change. Each group moved toward ($p=.02$) their cooperating teachers in increased silence following teacher questions.

Comparisons of Changes in Proximity in the "Indirect Cooperating Teacher" Groups

Table 41 reveals five proximity changes that were significantly different in the control and experimental indirect cooperating teacher groups. With one exception, the experimental group moved toward their cooperating teachers. Of the five changes, only two in the control group resulted in increased proximity.

Differences in proximity changes in the use of

TABLE 39

CHANGES¹ IN PROXIMITY FROM PHASE ONE TO PHASE THREE
WHICH ARE SIGNIFICANTLY DIFFERENT IN THE CONTROL
AND EXPERIMENTAL GROUPS

$\alpha = 0.05$

Variable	Median		Min U	Significance
	+ Towards - Away E	C		
Content	+4.58	-1.77	61.00	.05
Silence following T praise	+.16	0	44.00	.02
Row 8-9 I/I+D	+.92	-7.86	46.00	.02

¹Differences identified by the Mann-Whitney U test.

TABLE 40

CHANGES¹ IN PROXIMITY FROM PHASE ONE TO PHASE THREE
WHICH ARE SIGNIFICANTLY DIFFERENT IN THE CONTROL
AND EXPERIMENTAL "DIRECT COOPERATING TEACHER" GROUPS

$\alpha = 0.05$

Variable	Median ²		Min U	Significance
	E	C		
S initiated following S talk	+5.97	-2.30	1.00	.01
Silence fol- lowing T questions	+3.86	+13.62	2.00	.02

¹Differences identified by the Mann-Whitney U test.

²+ toward coop. - away coop.

criticism ($p=.02$) and criticism as a percentage of teacher talk ($p=.02$) resulted in moves toward their cooperating teachers in the experimental group. These moves represented a decrease in the use of criticism. The control group, while initially using less criticism, increased its use and moved toward their cooperating teachers on one measure of the use of criticism, and past them to obtain a negative proximity change on the other. The experimental group moved away ($p=.005$) from their cooperating teachers in increased percentages of silence following teacher questions, while the control group decreased its use and moved toward them. Proximity changes in extended acceptance of ideas ($p=.05$) and extended student initiated talk ($p=.05$) were both positive for the experimental group and negative for the control group.

TABLE 41

CHANGES¹ IN PROXIMITY FROM PHASE ONE TO PHASE THREE WHICH ARE SIGNIFICANTLY DIFFERENT IN THE CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING TEACHER" GROUPS
 $\alpha = 0.05$

Variable	Median ²		Min U	Significance
	E	C		
T criticism	+ .82	- .01	2.00	.02
T criticism/T talk	+1.86	+ .03	2.00	.02
Silence following T questions	-4.78	+3.69	0	.005
Extended T accepts ideas	+ .15	- .09	3.00	.05
Extended S initiated	+ .41	-1.15	3.00	.05

¹Differences identified by the Mann-Whitney U test.

²+ toward coop; - away coop.

DISCUSSION

Identification of Non-Random Changes in Verbal Patterns in the Entire Sample

Phase One to Phase Two

The experimental group experienced several significant changes during this first half of their student teaching experience. Many of these changes involved greater use of restrictive teacher talk, and more limited use of those categories seen by Flanders as indicative of expanding student freedom (decreases in use of praise, area A, and student response following student talk, and an increase in emphasis on content). Indications of increased student freedom, however, are seen in the increase of student initiated talk. Increased silence following lecture could indicate reticence, by the students, to participate in the class or, perhaps, a decrease in the tempo of teacher talk. The increased amount of student initiated talk leads the author to speculate that this silence is merely indicative of thoughtful pauses or decreased tempo.

The non-random changes observed in the period do not explain the decreased use of silence following praise. It is possible that this decrease indicates only that student teachers become more flexible in shifting from praise to other categories of teacher talk. The control group, however, did not exhibit this change.

There is less confusion about the two significant changes experienced by the control group for this period. Their decreased acceptance of student ideas, combined with the decrease in the use of area A, is indicative of a tendency to become more direct during this period of the student teaching experience.

Phase Two to Phase Three

The experimental group moved, during the last half of the student teaching experience, in the direction of more indirect teaching. This is evidenced by their increases in student response and extended student response.

When the students responded, they were evidently permitted (or felt the freedom) to develop their answers more completely. The decreased emphasis on content, lecture, and extended lecture would also support this interpretation of a move toward more indirect teaching. The increase in silence following teacher questions could mean resistance on the part of the students. The increased student response and extended response, however, would not support this conclusion. It is more likely that the students were taking a longer period of time to "think out" their answers or, that the tempo of classroom interaction had decreased.

With the exception of an increase in the revised row 8 I/I+D score, all significant changes in the control group were in various measures of silence in the classroom. The increased row 8 I/I+D score indicates that student response was greeted with an increased percentage of indirect teacher response. The increase in silence following student response could indicate thoughtful pauses or a decreased tempo. In itself, it does not indicate a more direct approach. The decreases in various aspects of silence for the control group would indicate a busier class and one in which the teacher exerted more control.

In summary, both groups experienced moves toward more indirect teaching influence during the last half of student teaching. The control group's moves were much less definitive, however.

Phase One to Phase Three

The four non-random changes exhibited by the control group during the entire student teaching experience are all in the direction of more direct teaching (increased use of directions following student talk, reduced Row 8-9 I/I+D score, and decreased use of Area A). The decrease in silence combined with the changes listed would indicate that the student teacher in the control group is a more active leader in the classroom at the end of the student teaching experience than at the beginning. He exerts more control (decrease in silence) and is more restrictive of pupil freedom. The changes in the experimental group are not as definitive. While their various I/I+D scores did not change significantly, their decreases in praise and student response and

increased emphasis on content are tendencies toward more direct teaching. The increases in various aspects of student initiated talk are indicative of moves toward more indirect teaching. One might say that both groups exhibited tendencies toward more direct teaching over the entire student teaching experience, but those trained in interaction analysis (the experimental group) also exhibited changes in the other direction.

Identification of Non-Random Changes in the "Direct Cooperating Teacher" Group

Both changes in the control group were in the direction of more direct teacher influence (decrease in questions following student talk and increase in silence following student response). The experimental DCT group, however, experienced changes in the direction of more indirect teacher influence (increased student initiated talk following student talk and increased row 8-9 I/I+D percentage). A surprising point was the significant increase in row 8-9 I/I+D, while the entire sample experimental group experienced a non-significant decrease in this score. This result is particularly surprising when one considers that these student teachers were under the influence of the most direct cooperating teachers.

One more interesting point should be made concerning the changes in the direct cooperating teacher group. In student initiated talk following student talk, and row 8-9 I/I+D percentage, the control and experimental groups changed in a manner which was just the reverse of the author's expectations. On both of these scores, the experimental group initially moved toward more indirect teacher influence, while the control group moved toward direct teacher influence. During the second half, however, the experimental group moved toward more direct influence on these two variables, while the control group moved toward more indirect influence. The control group exhibited a tendency, during the second half of student teaching, to become more indirect, in spite of the influence of a very direct cooperating teacher, and in spite of the fact that the entire control group moved toward more direct teacher influence. These changes are difficult to explain at this time.

Identification of Non-Random Changes in the "Indirect Cooperating Teacher" Group

If one can judge the effect that a cooperating teacher has on a student teacher by the number of changes, it would appear that indirect cooperating teachers exert more influence on their student teachers than do direct cooperating teachers. Those changes experienced by the control group were in the direction of more direct teacher influence. In particular, their increased emphasis on content, combined with a decreased acceptance of student ideas and use of area A, are indicators of this trend toward more direct teacher influence. The decrease in silence and extended silence probably indicates increased teacher control and a busier classroom atmosphere.

The decreases in criticism and extended criticism in the experimental group are indicative of more indirect teacher influence. A trend toward more direct teaching, however, is indicated by the decreased use of praise following student talk. Thus, the changes in the experimental group are not as definitive as those in the control group.

Identification of Non-Random Changes in Proximity in the Entire Sample

Phase One to Phase Two

While there were few changes during the first half of student teaching that could be related to the verbal patterns of the cooperating teachers, it is interesting to note that there were more changes in the experimental group than in the control group. In addition, all significant changes in the experimental group were toward the verbal patterns of their cooperating teachers, while the change in the control group was away from the cooperating teacher.

A rather interesting result of the analysis is that all proximity changes (with the possible exception of decreased silence following praise) in the experimental group were toward more direct teaching, while the one change in the control group was toward more indirect teaching.

Phase Two to Phase Three

There were only two changes in proximity during the second half of student teaching, both in the experimental group. In each case, the student teachers moved away from their cooperating teachers as they became more direct.

Phase One to Phase Three

Over the entire period of student teaching the student teachers in the experimental group moved away from their cooperating teachers about as frequently as they moved toward them. Their increases or decreases in proximity were about as likely to result in more direct teacher influence as in more indirect teacher influence. In short, there appeared to be little relationship between the indirect-direct aspects of their changes and their increases or decreases in proximity. They did, however, exhibit changes that were related to their cooperating teachers, while the control group experienced none. The control group's absence of non-random proximity changes might reflect less sensitivity to the teaching patterns of others.

Identification of Non-Random Changes in Proximity in the "Direct Cooperating Teacher" Group

The experimental DCT group experienced more proximity changes than the corresponding control group. There were, however, no apparent relationships between the indirect-direct aspects of their changes and their increases or decreases in proximity.

Identification of Non-Random Changes in Proximity in the "Indirect Cooperating Teacher" Group

The changes in proximity in both groups represented moves, generally, toward their cooperating teachers and toward more indirect teaching influence. Although the control group experienced a net negative proximity change, it represented a move toward, and then beyond, their cooperating teachers in a more limited use of teacher directions.

Comparisons of the Teaching Patterns of the Control and Experimental Groups

Comparisons of the Teaching Patterns of the Entire Sample

At phase one, the experimental and control groups differed from each other on variables that generally indicate a more indirect experimental group (less lecture, less teacher talk, and less emphasis on content). The experimental group was more likely to use praise following student talk. Their lower percentage of extended lecture probably indicates that they devoted less time to developing their thoughts than did the control group. The experimental group also more quickly acknowledged student response as indicated by the lower percentage of silence following student response.

Phase two reveals a much wider gap between the experimental group and the control group than existed at phase one (differences on 18 variables at phase two as opposed to 7 at phase one). With few exceptions, these differences indicate that the experimental group used more indirect teacher influence than did the control group, particularly in the larger use of acceptance of ideas, and the categories in area A. The larger amount of student initiated talk reflects the encouragement to student participation as indicated by the greater percentages in three different measures of I/I+D. The experimental group continued to have less content emphasis and extended lecture, but used less criticism following student talk. The experimental group, however, had less student response following student talk and less extended student response than did the control group. The experimental group continued to devote less time to developing their thoughts as indicated by a smaller percentage of time in extended lecture. The smaller amount of extended student response and extended teacher questions indicates that the experimental group did not develop their questions as fully as the control group, and asked more questions that required (or elicited) short student response.

A comparison of the teaching patterns at phase three indicates that the student teachers of the experimental group continued to have less lecture, emphasis on content, extended questions, and extended lecture. In addition, they made greater use of acceptance of ideas, the categories in area A, questions following student talk, extended

acceptance of ideas, and indirect response following student initiated talk. Their use of criticism following student talk was also significantly lower than that of the control group. Their use of the categories in the steady state cells was less, indicating less time in developing their thoughts. The lower amount of silence following student response probably indicates that the teacher more quickly acknowledged the response of a student.

Although the student teachers in the experimental group began as somewhat more indirect than the control group, they continued to become even more indirect in comparison. At phase one, they used more praise than the control group and less lecture, content statements, and teacher talk. This lower emphasis on teacher talk, lecture, and content continued throughout the student teaching experience. In addition, near the end of their student teaching experience, the experimental group used less criticism, more categories in area A, and revealed several measures that were highly indicative of indirect teacher influence.

The student teachers of the control and experimental group were most alike (based on the number of differences) at the beginning of student teaching. At phase two, they exhibited the greatest number of differences. At phase three, this number decreased somewhat, but was still larger than at phase one.

Comparisons of the Teaching Patterns of the "Direct Cooperating Teacher" Groups

At phase one, there was only one difference identified, and this in a measure of silence.

At phase two, there was less extended student response and student response following student talk in the experimental group. These differences could be interpreted as an indication of less student freedom. With these two exceptions, the experimental group exhibited definite tendencies toward more indirect teaching. They were higher on three different measures of I/I+D, and displayed a greater use of acceptance of ideas. They used less: lecture following student talk, criticism following student talk, and directions following student talk than

the control group.

Phase three again shows the student teachers very nearly alike. The experimental group was still, however, more indirect as indicated by their more limited use of criticism and higher revised row 8 I/I+D percentage.

The analysis of this section indicates that the student teachers of the DCT group, while initially quite alike, became quite different in their verbal patterns during the middle of the student teaching experience, as those student teachers who had had training in interaction analysis became more indirect. Near the end of their student teaching, they became more nearly alike, although those with training in interaction analysis still appear somewhat more indirect.

Comparisons of the Teaching Patterns of the "Indirect Cooperating Teacher" Groups

At phase one, the experimental ICT group used less lecture, placed less emphasis on content, and responded to student response more quickly. Although there was more praise in the experimental group, there was also more criticism. With the exception of the use of criticism, the experimental group displayed a greater tendency toward more indirect influence than did the control group.

At phase two, the experimental ICT group displayed more indirect tendencies than did the control group, as they increased the amount of student initiated talk and the use of categories in area A. When they used criticism, however, it was of longer duration than that used in the control group, and thus probably with greater effect. They used extended lecture less than the control group, which could mean that they developed their thoughts less thoroughly. The greater percentage of student initiated talk might permit one to interpret the lower amount of extended lecture to be due to student interruptions.

At phase three, the student teachers in the ICT groups moved back toward more similarities as the number of differences decreased to eight. The experimental group continued a trend toward shorter periods of time devoted to extended use of any single category. Their use of criticism was greater at phase three than that of the

control group, indicative of direct teacher influence. Indirect teacher influence was exhibited in a higher row 9 I/I+D percentage and a lower percentage of time used in lecture.

Comparisons of the Changes in Teaching Patterns
from Phase One to Phase Three in the
Control and Experimental Groups

Comparisons of Changes for the Entire Sample

A comparison of the changes in the entire sample revealed only six changes from phase one to phase three which were significantly different in the experimental and control groups. In every case, the experimental group exhibited a change which was greater in magnitude than that experienced by the control group. The direction, with the exception of two zero changes in the control group, was toward more direct teacher influence in both groups.

Comparisons of Changes in the "Direct Cooperating Teacher" Groups

A comparison of changes in the DCT group identified only one change as significantly different between the control and experimental groups. This change indicates that the experimental group developed a greater tendency to ask questions following student talk, while the control group tended to ask fewer questions.

Comparisons of Changes in the "Indirect Cooperating Teacher" Groups

A comparison of changes in the ICT group identified five changes as significantly different in the experimental and control groups. With one exception, these changes were in the same direction in both groups, but the experimental group experienced changes that were greater in magnitude. The magnitude of the change in the revised row 9 I/I+D percentage was greater in the control group than in the experimental group. The control

group decreased in this percentage while the experimental group experienced an increase in it. The indirect-direct aspects of these changes were inconclusive.

Comparisons of the Changes in Proximity Scores
from Phase One to Phase Three in the Control
and Experimental Groups

Comparisons of Changes in Proximity for the Entire Sample

A comparison of changes in the entire sample identified only three as significantly different. These proximity changes represent moves by the experimental and control groups toward more direct teacher influence (increased emphasis on content and a decreased row 8-9 I/I+D percentage). The larger magnitudes of the changes in the control group resulted in moves initially toward their cooperating teachers and finally past them with resulting decreased proximity scores. All moves in the experimental group were toward their cooperating teachers.

Comparisons of Changes in Proximity in the "Direct Cooperating Teacher" Groups

A comparison of changes in the DCT groups identified only two changes as significantly different in the control and experimental groups. With one exception, both groups moved, on each of these changes, toward their cooperating teachers. No patterns could be discerned concerning either the direct-indirect aspects of these moves, or the magnitude of the changes.

Comparisons of Changes in Proximity in the "Indirect Cooperating Teacher" Groups

In the ICT groups, a comparison of the changes indicated, with one exception, that the experimental group experienced changes that were greater in magnitude than those experienced by the control group. The control group tended to move away from their cooperating teachers, while the experimental group tended to move toward them. No pattern was evident concerning the direct-indirect aspects of these changes.

CONCLUSIONS

The following conclusions are limited to the population of secondary science student teachers at Cornell University from 1963-1966, and to the variables defined in this study. These conclusions are based primarily on the findings for the entire sample, although references will be made to the results obtained in the "extreme" groups. The very small sample sizes prohibit, in the opinion of the author, any conclusions based on the results of these "extreme" groups. The findings from these groups will serve, as intended, to indicate possible directions for further research. Within the limitations of this study, the author concludes that:

1. The most rapid period of change in verbal behavior occurs during the first half of student teaching for those student teachers trained in interaction analysis, and during the second half for those not so trained.

Those student teachers trained in interaction analysis experienced 13 non-random changes during the first half of student teaching compared with 6 changes during the second half. Those not so trained experienced 2 changes during the first half of student teaching compared to 5 changes during the second half.

2. After the first half of student teaching, those student teachers trained in interaction analysis, and those not so trained, experience changes that decrease the number of differences between them.

The student teachers of the control and experimental groups initially moved away from each other in similarities of verbal patterns. During the second half of student teaching, however, this direction reversed and the number of differences decreased so that they again became more alike. This tendency to move away and then return was most obvious in the extreme cooperating teacher groups. The experimental and control direct cooperating teacher groups began with only one difference and at phase two exhibited twelve differences. Phase three found the two groups different in only two variables. The experimental and control indirect cooperating teacher groups began with eight differences and ended with eight differences (most of them similar in nature). At phase two, they were different in eleven variables.

The author also concludes that secondary science student teachers, who have been trained in interaction analysis, differ significantly from a control group who are not so trained, in the following respects:

1. They experience more non-random changes in their verbal patterns.

Based on the number of non-random changes, those student teachers who have had training in interaction analysis appear to be much more likely to change in a directional manner than those not so trained. The experimental group had 13, 6, and 10 non-random changes during the first half, the second half, and the entire period of student teaching, respectively. During these same periods, the control group experienced only 2, 5, and 4 non-random changes.

Although the experimental group in the entire sample clearly experienced more non-random changes than did the control group at every phase of observation, this pattern was not reproduced in either of the "extreme" groups. In the DCT group, the number of changes was equally divided between the control and experimental groups. In the ICT group, the number of changes was greater in the control group than in the experimental group (5 non-random changes in the control group compared to 3 in the experimental group). This pattern is inconsistent with that of the entire sample.

2. They experience more non-random changes toward indirect teacher influence, and fewer non-random changes toward direct teacher influence.

In both the experimental and control groups, there were tendencies for the student teachers to become more direct over the student teaching experience. The experimental group, however, had fewer changes toward direct teaching and had more changes toward indirect teaching.

If one compares the significant changes during each half with those over the entire period of student teaching, a pattern emerges. During the first half of the student teaching experience, both groups moved in the general direction of more direct teaching. During the second half, however, the experimental group's changes can all be interpreted as movement toward more indirect teaching, while the control group had only one

move in this direction.

Although the experimental group moved very definitely in the direction of more indirect teaching during the second half of the student teaching experience, some of these changes were not large enough to compensate for the initial direct changes. For example, student response initially decreased but increased significantly during the second half of student teaching. The magnitudes were such, however, to result in a net change in the negative direction for this score. Emphasis on content increased during the first half but decreased during the second. The overall change, however, was still a significantly negative one. Thus, the student teachers in the experimental group are seen to move initially toward direct teaching patterns, and then reverse this trend and experience non-random changes toward indirect teaching patterns. Many of these later changes, however, were not sufficient to compensate for the substantial initial direct tendencies and resulted in a net movement toward more direct teaching for some scores. The control group moved much more consistently toward more direct teaching throughout the student teaching experience.

A somewhat different picture emerges if one looks at the non-random changes which occurred in the direct cooperating teacher group. Both the control and experimental DCT groups experienced net changes that reflected the changes experienced by the entire sample. During the second half of student teaching, however, the experimental DCT group moved toward more direct teaching, while the corresponding control group moved toward more indirect teaching. This pattern did not exist for the entire sample.

Those student teachers of the indirect cooperating teacher group experienced non-random changes that were more consistent with those of the entire group. The experimental indirect cooperating teacher group experienced changes toward more indirect teacher influence with the exception of a decrease in the use of praise following student talk. The corresponding control group exhibited changes toward direct teacher influence.

A comparison of the changes from phase one to phase three yielded little additional insight into the nature of these changes. In general, the student teachers of the experimental groups considered (the entire sample and the direct and indirect cooperating teacher groups)

experienced changes that were greater in magnitude than those of the control group.

4. They use more indirect teacher influence.

The student teachers in the experimental groups began teaching as somewhat more indirect than those in the control groups. In general, the differences that existed at both phase two and phase three would place the student teachers who received training in interaction analysis as more indirect than those who did not receive this training.

Those student teachers in the indirect cooperating teacher group are a possible exception. At phase two, one would probably be secure in categorizing the experimental ICT group as more indirect than the control group, based on the differences. One can say that there are more differences indicative of indirect teacher influence than there are of direct teacher influence. At phase three, however, there is some question of whether the differences are more indirect or direct. It is possible that the experimental ICT group is more direct than the control group at phase three. This result is surprising when we consider the results of the entire sample. It is possible that the student teachers that happened to be assigned to these indirect cooperating teachers had more direct tendencies than the rest of the sample. It is also possible that there is some reverse effect present. Perhaps these student teachers who have training in interaction analysis observe indirect teachers in action and decide against modeling their teaching after them. The question remains to be answered.

With the exception of the indirect cooperating teacher group, a comparison of student teachers who have received training in interaction analysis with those who have not received such training reveals several significant differences at the end of their student teaching experience. These differences, with few exceptions, are indicative of more indirect teacher influence on the part of those student teachers who have had the training.

5. They are more likely to change their verbal patterns in relation to those of their cooperating teachers.

These data seem to indicate that those student teachers who had training in interaction analysis, compared with a control group who did not have this

training, were more conscious of the verbal patterns of their cooperating teachers and were more likely to change in relation to them. During the first half of student teaching, the experimental group exhibited four proximity changes while the control group experienced one. During the second half, the experimental group exhibited two changes in proximity while the control group had none. The data for the entire period reveals five changes in the experimental group, while no overall proximity changes were experienced in the control group.

In the direct cooperating teacher group, those student teachers who received training in interaction analysis experienced more changes in proximity than those who did not receive such training. This result is consistent with the findings for the entire sample.

There were more changes in proximity in the ICT group than in either the DCT group or the entire sample over any period investigated. It is also interesting to note that, again, the "extreme" group differs from the entire sample in that the experimental and control ICT groups experienced the same number of changes in proximity.

Although the author does not wish to state this as a conclusion, there is some evidence that those student teachers with training in interaction analysis are more likely to change their patterns of verbal behavior toward those of their cooperating teachers than are student teachers without such training. The pattern of change in the entire sample indicates that the experimental group tends to move, during the first half of student teaching, toward their cooperating teachers. During the second half, however, they tend to move away from them. Over the entire period, they move away from their cooperating teachers about as frequently as they move toward them. There was also no apparent pattern of movement in the DCT group. A comparison of changes, however, revealed that the control and experimental groups differed primarily in the experimental group's tendency to move toward their cooperating teachers. In the ICT group, this tendency was most pronounced.

All significant changes in the ICT group represented increases in proximity, or decreases in proximity that were the result of the student teachers' movements toward their cooperating teachers and final surpassing of them in the pattern "adopted." The changes exhibited by both groups, as they moved toward their cooperating

teachers, were toward more indirect teacher influence. Thus, the indirect cooperating teachers appear to have had more influence on the changes in the verbal behavior of their student teachers than either the direct cooperating teachers or the entire sample of cooperating teachers.

IMPLICATIONS FOR FURTHER RESEARCH

The results of this study indicate several directions for further research:

1. There is a need to follow-up the student teachers of studies such as this into their teaching careers. As time passed, fewer differences were apparent between those student teachers who received training in interaction analysis and those who did not. Is it possible that these student teachers, in time, will be no different from those who did not have this training? Subsequent studies are needed in which groups such as these are followed into their teaching careers and are observed at regular intervals. It is quite possible that any effect this training has is short range. If so, the training probably has little or no value and interaction analysis should remain a research tool rather than a pedagogical aid.
2. The effect of variations in the training in interaction analysis should be considered. The student teachers of this study neither liked nor valued the training received--yet it appeared to have a significant effect on them. Would this training have a greater effect if the student teachers placed a high value on the training? Would training prior to the student teaching experience be more valuable? Would more thorough training be more effective? The effect of training in other systems of analysis should also be studied.
3. The effect of training the cooperating teachers in interaction analysis should be studied. If the student teacher were to be under the influence of one knowledgeable in interaction analysis, it would seem that there would be many more non-random changes detectable by the system than if the cooperating teacher had no knowledge of it. If both the student

teacher and the cooperating teacher were trained in interaction analysis, one might expect an even greater effect. This, of course, is pure speculation.

4. New observational systems must be developed that are capable of meeting the special needs of science teaching. At the present, for example, the laboratory portion of science teaching cannot be described adequately by any objective observational system. The system developed by Parakh (1965) is a beginning, but much more is needed. Millions of dollars are being spent to develop new science courses with heavy emphasis on the laboratory. Yet, we have little direct knowledge of the value of this laboratory training.
5. Although conclusions based on the findings of the "extreme" groups are tenuous, some of the findings indicate a need for further studies involving direct or indirect cooperating teachers. In most parts of this analysis, the results for the "extreme" groups did not parallel those of the entire sample. In fact, they were, at times, in the opposite direction. Further, the indirect cooperating teachers appeared to have the greatest influence on their student teachers. In general, the direct cooperating teacher group experienced fewer identifiable changes than either the indirect cooperating teacher group or the entire sample. These variations from the patterns established by the entire sample indicate, in the opinion of the author, a need for studying more closely, and with larger samples, the effects of cooperating teachers who are extreme on various criteria.

SUMMARY

Introduction

The effect of public school cooperating teachers on their student teachers is generally considered to be large. It would seem profitable for educational research to study these effects and investigate ways of making them more beneficial. Until recently, however, there have been relatively few studies involving the cooperating teacher. Part of the problem has been the lack of research tools that would enable one to study teaching objectively.

The development of techniques of interaction analysis has provided researchers with valuable observational tools with which to study teaching in at least some of its dimensions. The Flanders System of Interaction Analysis, in particular, has shown considerable promise in its ability to describe the verbal interaction taking place in the classroom in terms of the dimension of directness of teacher influence.

Recent studies also indicate that training in interaction analysis might be beneficial to in-service and pre-service teachers. It would seem that a knowledge of this technique would give a student teacher a greater awareness of his cooperating teacher's verbal patterns and help him to be more selective in the teaching patterns he adopts. In addition, this knowledge would make him more conscious of his own teaching behavior. Although interaction analysis can not tell the teacher how best to teach, it can provide a "mirror" that will help the student teacher to modify his own teaching to conform more closely to his intentions.

It was the purpose of this study to use interaction analysis to obtain systematic objective observations of student teachers and their cooperating teachers to determine if, in fact, student teachers really do adopt the teaching patterns of their cooperating teachers, and whether training in interaction analysis makes any difference in the way student teachers change during the student teaching experience.

Objectives

The objectives of this study were:

1. to identify non-random changes which occur in the verbal patterns of student teachers who are trained in the Flanders System of Interaction Analysis.

2. to search within these verbal patterns for changes that are related to the verbal patterns of their cooperating teachers.
3. to compare the verbal patterns of the experimental group with those of a control group who were not trained in the Flanders technique.
4. to provide implications for further research.

Method

During the school years 1964-1965 and 1965-1966, two groups of Cornell University student teachers of secondary science and their cooperating teachers were observed, using the Flanders System of Interaction Analysis. Both groups had similar educational background with the exception that the 1965-1966 group of twelve student teachers (hereafter referred to as the experimental group) were given additional training in the Flanders System of Interaction Analysis. The 1964-1965 group of eighteen student teachers did not receive this training and will be referred to as the control group (Matthews, 1966).

Because of the small number of student teachers available, it was considered desirable to use the entire population in preference to a random sampling technique. Thus, with the exception of two student teachers assigned to schools at a distance of more than eighty miles from Cornell, the entire body of science student teachers in 1964-1965 became the control group and the entire body of science student teachers in 1965-1966 became the experimental group. An application of the Kolmogorov-Smirnov One-Sample Test to 23 pre-selected characteristics of science student teachers at Cornell University failed to reject, at the .05 level, the null hypothesis that the samples could have been drawn from the population of science student teachers at Cornell from 1963 to 1966.

Six observations of 30 to 60 minutes each were obtained for each student teacher and for each cooperating teacher. These observations were coded using the Flanders System of Interaction Analysis. To provide information relating to change in verbal patterns, the six observations of the student teachers were divided into three groups consisting of: (a) phase one--two observations near the beginning of student teaching, (b) phase two--two observations near the middle of student teaching, and (c) phase

three--two observations near the end of the student teaching experience. Each observation of a particular student teacher was obtained as he taught the same class of pupils in the same subject.

After the student teachers had completed their student teaching experience and had returned to the university campus, the cooperating teachers were observed for six periods of 30 to 60 minutes each, teaching the same group of pupils as had been taught by their respective student teachers.

After the first phase of observations had been completed, the experimental group of student teachers met for a series of five weekly seminars of two hours each, in which they received instruction in the Flanders System of Interaction Analysis. The training emphasized analysis of the Flanders matrix, discussions of various teaching patterns, and practice (using "role playing") at varying one's teaching patterns. No emphasis was placed on high observer reliability. The training stressed flexibility of teaching patterns to suit the objectives of the teacher. No value judgments were made by the instructor concerning "good" or "bad" patterns of teaching. The individual student teacher was the sole judge of the appropriate teaching pattern for a given learning situation.

After they had completed their student teaching assignments, the student teachers evaluated the training they had received in interaction analysis. The value they placed on this training can be summarized as low. On a scale ranging from "no evidence" (0) to "outstanding" (10), a median value of 3 was given to their opinion of the potential value this training might have to them as teachers. The only item ranked lower than 3 was the value placed on their own experimentation with the system in teaching their classes (rank of 2).

At each phase of observation and for each individual teacher, a Flanders matrix was plotted and 59 different scores computed representing various aspects of teacher-pupil verbal interaction.

The 59 scores for the control and experimental groups were subjected to the Friedman Two-Way Analysis of Variance by Ranks test to identify non-random changes: (a) during the first half of student teaching (phase one to phase two), (b) during the second half of student

teaching (phase two to phase three), and (c) during the entire period of student teaching (phase one to phase three).

Relationships between the changes in verbal patterns of the student teachers and the verbal patterns of their cooperating teachers were also sought. A proximity score was defined as the absolute difference between a student teacher's score on a particular variable and the corresponding score of his cooperating teacher. These proximity scores were then analyzed by means of the Friedman test for non-random changes during the first half, the second half, and the entire period of student teaching.

A two-tailed Mann-Whitney U test was used to compare the scores of the experimental and control groups at phase one, phase two, and phase three.

Based on their revised I/I+D scores, the one-third most direct and the one-third most indirect cooperating teachers were identified in each group. These cooperating teachers and their student teachers were respectively defined as the "direct cooperating teacher" (DCT) group and the "indirect cooperating teacher" (ICT) group. The analysis described above was then performed on the scores of each of these two "extreme" groups.

Friedman significance tables for two phases (e.g., phase one to phase two) were not available for groups as small as the direct and indirect cooperating teacher groups. Because of this, it was only possible to search for changes across the entire period of student teaching. This problem did not exist when using the Mann-Whitney U test for comparisons between the groups.

The small sample sizes used in the direct and indirect cooperating teacher groups render the findings tentative at best. The analysis was performed primarily to indicate directions for further research.

Results

The Entire Sample

A comparison of teaching patterns between the control and experimental groups revealed:

At phase one 7 differences were significant at

the .05 level. The student teachers of the experimental group used more praise, less total teacher talk, and placed less emphasis on content than did those of the control group.

At phase two, the student teachers of the control and experimental groups differed from each other on 18 of the 59 variables considered ($\alpha = .05$). The experimental group had less extended student response and student response following student talk, more acceptance of ideas, more teacher talk in area A, more student initiated talk, a higher row 8-9 I/I+D percentage, a higher revised row 8 I/I+D percentage, a higher revised row 9 I/I+D percentage, less emphasis on content, less extended lecture, and less criticism following student talk.

At phase three, the experimental and control groups were different on 13 variables ($\alpha = .05$). The experimental group exhibited more: acceptance of ideas, teacher talk in area A, questions following student talk, extended acceptance of ideas, indirect response following student initiated talk, and silence following teacher criticism. They had less: lecture, content emphasis, criticism following student talk, extended questions, extended lecture, and silence following student response.

An analysis of the non-random changes experienced by both groups during their student teaching experience yielded the following:

During the first half of student teaching, 13 non-random changes in the experimental group and 2 in the control group were identified as significant at the .05 level. The experimental group decreased in measures of teacher praise used, the amount of student response, tallies falling in area A, and silence following the use of praise. They experienced increases in emphasis on content, measures of student initiated talk, and silence following lecture. The control group decreased in the extended acceptance of ideas and the percentage of tallies falling in area A.

During the second half of student teaching, there were only 6 non-random changes identified

in the experimental group and 5 in the control group ($\alpha = .05$). The experimental group experienced decreases in measures of their emphasis on content and use of lecture, and increases in measures of student response and silence following teacher questions. The control group increased their row 8 I/I+D percentage, the percentage of silence following student response, and decreased in three other measures of silence in the classroom.

An analysis of the changes that took place over the entire student teaching experience revealed 10 non-random changes in the experimental group and 4 in the control group ($\alpha = .05$). The experimental group decreased in three measures of praise and in the amount of student response. Other non-random changes over the entire student teaching period revealed increases in student initiated talk and content emphasis in the experimental group.

The control group decreased in silence, teacher talk in area A, and row 8-9 I/I+D percentage, but increased in directions following student talk.

An analysis of non-random changes in relation to the cooperating teachers detected:

During the first half of student teaching, 4 changes in proximity in the experimental group and 1 in the control group as significant ($\alpha = .05$). All of these changes in the experimental group were toward their cooperating teachers, while the change in the control group was away from their cooperating teachers. These changes in proximity represented moves toward more direct teaching in the experimental group and toward more indirect teaching in the control group.

During the second half of student teaching, only 2 changes in proximity ($\alpha = .05$), both in the experimental group. In each case, the student teachers of the experimental group moved away from their cooperating teachers toward more direct teaching influence.

No proximity changes in the control group over the entire student teaching period, but 5 overall changes in the experimental group ($\alpha = .05$).

No patterns could be discerned in the direction of these moves nor in the type of changes in verbal patterns that they represented.

The "Direct Cooperating Teacher" Group

A comparison of teaching patterns between the control and experimental DCT group revealed:

The student teachers of the direct cooperating teacher group began teaching with only 1 difference in their verbal patterns. The experimental group had more silence following acceptance of ideas.

At phase two, the experimental and control groups were significantly different on 12 of the 59 variables considered ($\alpha = .05$). The experimental group revealed a higher row 8-9 I/I+D percentage, revised row 8 I/I+D percentage, and revised row 9 I/I+D percentage than did the control group. They had more extended acceptance of student ideas and silence following acceptance of student ideas. The experimental DCT group was lower than the corresponding control group in measures of teacher lecture, teacher directions, teacher criticism, the amount of student response following student talk, extended student response, and silence following questions and criticism.

At phase three, there were only 2 differences ($\alpha = .05$). The experimental group used less criticism and had a higher revised row 8 I/I+D percentage than did the control group.

An analysis of the non-random changes experienced by both DCT groups revealed:

During the entire student teaching experience, 4 non-random changes ($\alpha = .05$). The experimental group increased in student initiated talk and in their row 8-9 I/I+D percentage. The control group decreased their use of questions following student talk and increased in silence following student response.

An analysis of non-random changes in relation to the cooperating teachers detected:

Four (4) proximity changes in the DCT group, 3 of which were in the experimental DCT group ($\alpha = .05$). The control group moved toward their cooperating teachers as the amount of silence following teacher questions increased. The experimental group moved away from their cooperating teachers as they decreased in two measures of the use of criticism. They moved toward their cooperating teachers as the percentage of student initiated talk increased.

The "Indirect Cooperating Teacher" Group

A comparison of teaching patterns between the control and experimental ICT groups revealed:

The student teachers of the ICT group began teaching with 8 differences in their verbal patterns ($\alpha = .05$). The experimental group was lower in measures of teacher lecture, teacher talk, emphasis on content, and silence following student response. They used more criticism and praise than did the control group.

At phase two, there were 11 differences in their verbal patterns ($\alpha = .05$). The experimental ICT group was lower in measures of lecture, teacher talk, content emphasis, silence following student talk, and silence following teacher directions. They used more criticism, but had higher percentages in student initiated talk, area A, and silence following acceptance of ideas.

At phase three, there were 8 differences in their verbal patterns ($\alpha = .05$). The experimental group was higher on three measures of criticism and on the row 9 I/I+D percentage than was the control group. They had less lecture and silence following student response and a lower percentage of tallies in the total teacher steady state cells.

An analysis of non-random changes experienced by both ICT groups reveals:

During the entire student teaching experience,

8 non-random changes in verbal patterns ($\alpha=.05$). Of these, 5 were in the control group and 3 were in the experimental group. The experimental group decreased in measures of criticism and praise following student talk. The control group increased their content emphasis, but decreased in acceptance of ideas, teacher talk in area A and measures of silence.

An analysis of non-random changes in relation to the cooperating teachers detected:

Six (6) changes in proximity equally divided between the control and experimental groups ($\alpha = .05$). The experimental group moved toward their cooperating teachers in three measures of criticism as they decreased in each. The control group moved away from their cooperating teachers on two measures of the use of directions as they decreased the use of each. These moves, however, represented an initial move toward their cooperating teacher in the decreased use of directions followed by a further decrease in their use which caused the group to move beyond their cooperating teachers and away from them.

Discussion

Limitations imposed by the inability to sample randomly the two groups from a larger population are inherent in this study. Nevertheless, the comparisons to be drawn, while certainly not conclusive, can provide insight into the nature of the effect of the cooperating teacher and indicate directions for further research.

The Entire Sample

The student teachers of the experimental group began their student teaching using more indirect verbal influence than did those in the control group, as indicated by the seven differences between the groups.

During the first half of student teaching, the experimental group experienced 13 non-random changes while the control group experienced only two. It appears that those in the experimental group were "trying" different patterns

of teaching with a greater sense of direction than were those in the control group. One might expect that the experimental group would have become more indirect, but, in fact, both groups experienced changes that were toward more direct teaching influence--with the exception of an increase in student initiated talk in the experimental group.

While both groups moved toward more direct teacher influence during the first half of student teaching, a comparison of the teaching patterns at phase two reveals that the control group became more direct than did the experimental group. At phase two, the student teachers of the control and experimental groups differed from each other on 18 of the 59 variables considered. With the exception of two measures of student response, these differences are all indicative of a more indirect experimental group.

During the second half of student teaching, there were only 6 non-random changes identified in the experimental group and 5 in the control group. These changes in the experimental group were all toward more indirect teacher influence. The control group experienced one change that was indicative of more indirect teacher influence. With this exception, the changes were in measures of silence in the classroom which, by themselves, are difficult to interpret. Thus, the experimental group moved toward more indirect teaching during the second half while the control group was less definitive in its changes.

If one looks at the entire period of student teaching (phase one to phase three), it can be seen that both groups moved toward more direct teaching influence, but the experimental group also experienced moves toward more indirect teaching. The control group did not. These changes resulted in a more indirect experimental group, as indicated by a comparison of teaching patterns at phase three.

At phase three, the experimental and control groups were different on 13 variables. All of these indicated less emphasis on teacher control in the experimental group and, in general, a use of more indirect verbal influence.

A study of non-random changes in relation to their cooperating teachers detected only 4 changes in proximity in the experimental group and 1 in the control group during the first half of student teaching. All of the

changes in the experimental group were toward their cooperating teachers, while the change in the control group was away from their cooperating teachers. These changes represented moves toward more direct teaching in the experimental group and toward more indirect teaching in the control group.

The second half of student teaching showed only 2 changes in proximity, both in the experimental group. In each case, the student teachers of the experimental group moved away from their cooperating teachers toward more direct teaching influence.

There were no proximity changes in the control group over the entire student teaching period, but there were 5 overall changes in the experimental group. No patterns could be discerned in the direction of these moves nor in the type of changes in verbal patterns that they represented.

Perhaps the most readily apparent difference encountered in the two groups was the number of changes detected. The experimental group experienced far more total non-random changes (29) than did the control group (11). Changes with respect to their cooperating teachers were also more numerous (11 in the experimental group compared with only 1 in the control group). This apparent increased tendency to change could mean that those student teachers with training in interaction analysis are more sensitive to the teaching patterns of others, as well as their own, and tend to experiment more freely with different patterns. This hypothesis is supported by the fact that the changes in proximity were far more numerous in the experimental group but failed to indicate a directional tendency. If it is desirable to encourage experimentation on the part of student teachers, it would seem that training in interaction analysis might be worthy of further consideration.

Two questions arise immediately concerning these results. First, the experimental group began teaching in a more indirect manner than did the control group. It is possible that they may have continued to become more indirect without training in interaction analysis--i.e., the results may be due to sample bias. Second, the number of differences between the experimental group and the control group peaked at the middle of the student teaching experience and decreased toward the end. If these observations could have been extended into their

teaching career, perhaps one would have found that, after a time, there was little or no difference between the two groups. If the effect is present, but only short lived, the value of the training is questionable. These questions and others of similar nature can only be answered by further duplication and extensions of the present work.

The "Direct Cooperating Teacher" Group

The student teachers of the experimental DCT group began their student teaching with only one difference, and this only in a measure of silence in the classroom. During the entire student teaching period, there were only 4 non-random changes identified. The overall changes were toward more direct teacher influence in the control group and toward more indirect influence in the experimental group.

A comparison of the scores at each phase indicates that the control and experimental DCT groups, while initially very similar, experienced changes that resulted in their becoming quite different at phase two, but again very similar at phase three (1, 12, and 2 differences at phase one, two, and three, respectively). These differences at phase two and three would indicate a more indirect experimental group.

There were 4 proximity changes in the DCT group, three of which were in the experimental group. There were no apparent relationships between the indirect-direct aspects of their changes and their increases or decreases in proximity.

Although the changes in proximity do not indicate excessive cooperating teacher influence in the direct group, the tendency of the experimental and control groups to become quite dissimilar near the middle of their student teaching, and yet to exhibit only 2 differences at the end of student teaching, raises some questions. This tendency to become more alike near the end of student teaching, although present in all phases of the analysis, is more pronounced in the direct cooperating teacher group. More research is needed to explore the possible reasons for this.

The "Indirect Cooperating Teacher" Group

The student teachers of the experimental ICT group began their student teaching with 8 differences in their verbal patterns. With the exception of a greater use of criticism, the experimental ICT group began their student teaching using more indirect teacher influence than the control group. During the entire student teaching experience, 8 non-random changes in verbal patterns were identified. Of these, 5 were in the control group and 3 in the experimental group. The changes in the control group were toward a busier classroom atmosphere and more direct teacher influence, while the changes experienced by the experimental group were not as clearly defined.

A comparison of the scores at each phase shows that the control and experimental ICT groups remained fairly constant in the number of differences in their verbal patterns (8, 11, and 8 differences at phase one, two, and three, respectively). At all three phases, the experimental group appears more indirect than the control group with the exception of a greater use of criticism which was present each time. It is questionable whether the experimental group was more indirect at phase three than at phase one. The number of differences was the same and the nature of the differences was very similar.

There were 6 changes in proximity equally divided between the control and the experimental groups. All changes in proximity in the indirect cooperating teacher group were toward their cooperating teachers during both halves of the student teaching period, or toward during the first half followed by a move away during the second half. There were two such moves away during the second half of student teaching, both in the control group. They represented, however, continued decreases in the use of directions, which caused the control group initially to move toward their cooperating teachers and then to move beyond them in a more limited use of teacher directions. All moves in both groups were toward more indirect teacher influence. Thus, both groups appeared to be influenced by their cooperating teachers in this ICT group.

Conclusion

The conclusions stated are limited to the population of secondary science student teachers at Cornell University

from 1963-1966, and to the variables defined in this study, and are based on the results of the entire sample only. Within the limitations of this study, the investigator concludes that:

1. The most rapid period of change in verbal behavior occurs during the first half of student teaching for those student teachers trained in interaction analysis, and during the second half for those not so trained.
2. After the first half of student teaching, both those student teachers trained in interaction analysis and those not so trained experience changes that decrease the number of differences between them.

The investigator also concludes that secondary science student teachers, who have been trained in interaction analysis, differ significantly from a control group not so trained, in the following respects:

1. They experience more non-random changes in their verbal patterns.
2. They experience more non-random changes toward indirect teacher influence.
3. They experience fewer non-random changes toward direct teacher influence.
4. They use more indirect teacher influence.
5. They are more likely to change their verbal patterns in relation to those of their co-operating teachers.

Implications for Further Research

The findings of this study point to the need for further research in several areas. The following list contains those findings that the author feels are especially pertinent.

1. In view of the apparent decreases from phase two to phase three in the number of differences between those trained in interaction analysis and those not so trained,

there is a need to follow-up the student teachers of studies such as this into their teaching careers. It is possible that the effects noted in this study are only short-range.

2. Variations in the training of interaction analysis should be studied for different effects. In particular, these variations should include:
 - (a) more extensive instruction in interaction analysis.
 - (b) different approaches to the instructional technique itself.
 - (c) instruction in other systems of analysis of teaching behavior.
3. Research is needed on the effect of training the cooperating teachers in interaction analysis, in addition to, and also instead of, training the student teachers in the technique.
4. The unusual fluctuations in the number of differences between the control and experimental groups in the DCT and ICT groups, and the tendency for student teachers to move toward their cooperating teachers in the ICT group, indicate a real need to study student teachers assigned to cooperating teachers who represent "extremes" on various criteria.
5. Observation systems, such as the one developed by Parakh (1965), must be developed and perfected to meet the special needs of science teaching. A very important (at least we think it is important) part of science teaching was omitted from this study because of an inability to describe adequately the laboratory portion of the science classrooms.
6. Finally, one very interesting implication of this research concerns the apparent .

change in behavior ("learning") brought about by the training in interaction analysis --the training that the student teachers neither liked, nor valued. This training was accomplished using a rather direct approach (unintentionally). Since the results of this study confirmed, where applicable, the findings of others who have reported that the student teachers placed high value on the training received, it raises serious questions concerning the cherished notion that the way we teach is as important as what we teach. It seems, to the author, that giving this type of training to student teachers, with subsequent observation, provides a very nice method of investigating these questions. Research is needed in which the results of those who placed high value on the training would be compared with the results of those who placed little value on it.

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APPENDIX A

SCORES USED TO COMPARE THE EXPERIMENTAL GROUP WITH THE
POPULATION OF SCIENCE STUDENT TEACHERS AT
CORNELL UNIVERSITY FROM 1963 to 1966

TABLE A-1

STATISTICS ON SELECTED CHARACTERISTICS OF SCIENCE STUDENT
TEACHERS AT CORNELL UNIVERSITY FROM 1963 TO 1966

Student Teacher	S.A.T. at		Cumulative 3rd Year Average	Allport Vernon Lindzey Study of Values					
	Entrance V	M		Th.	Ec.	Ae.	So.	Po.	Re.
1	654	728	80.56	5	3	3	1	4	1
2	469	549	75.54	3	3	2	3	1	5
3	605	519	73.57	3	3	2	5	3	3
4	555	570	73.07	5	3	3	2	4	4
5	570	535	74.67	2	3	6	3	1	4
6	588	612	81.50	5	3	3	3	3	1
7	542	611	83.19	3	3	3	5	4	1
8	525	674	77.43	3	3	3	3	5	3
9	510	504	78.65	3	1	2	5	2	5
10	628	755	88.11	5	1	3	1	3	3
11	701	557	85.00	3	1	4	5	2	3
12	527	632	79.72	5	3	3	3	3	2
13	589	643	81.00	-	-	-	-	-	-
14	509	495	78.00	4	2	3	1	3	3
15	605	638	78.72	5	3	3	3	4	1
16	689	672	82.79	5	1	4	3	3	2
17	602	609	80.83	4	5	2	4	3	1
18	661	719	85.27	5	1	3	3	3	1
19	731	647	88.59	3	3	3	3	3	3
20	451	604	81.65	4	3	3	1	3	3
21	435	494	83.21	4	3	2	3	3	3
22	560	604	77.17	5	5	3	1	4	1
23	615	652	79.00	-	-	-	-	-	-
24	688	652	80.00	5	3	3	3	3	1
25	498	669	82.80	5	4	4	1	4	1
26	654	593	75.21	5	4	3	1	3	2
27	554	664	83.80	5	3	3	3	3	1
28	586	621	77.38	2	1	3	4	3	5
29	657	521	82.40	5	5	3	2	3	1
30	636	693	85.00	4	3	3	3	3	3
31	670	599	86.00	3	2	3	4	5	2
32	630	582	82.00	3	2	3	3	2	4
33	628	591	80.00	4	1	3	3	3	4
34	641	746	80.83	3	2	3	3	2	5
35	536	661	83.00	5	3	2	2	3	3
36	663	647	78.00	5	3	3	3	3	2
37	589	697	77.00	3	3	3	2	3	4
38	530	600	77.00	5	3	4	2	3	1
39	557	650	78.44	-	-	-	-	-	-
40	602	586	78.81	4	1	5	3	4	2
41	536	652	77.00	5	2	2	3	1	3

TABLE A-1 (cont'd.)

Student Teacher	S.A.T. at Entrance		Cumulative 3rd Year Average	Allport Vernon Lindzey Study of Values					
	V	M		Th.	Ec.	Ae.	So.	Po.	Re.
42	502	501	83.33	5	3	3	1	5	1
43	588	612	81.00	5	4	5	1	4	1
44	642	600	81.00	4	2	3	3	3	3
45	684	582	77.00	4	3	3	2	3	3
46	586	587	80.41	4	1	4	2	4	3
47	643	627	86.03	5	3	3	5	1	2
48	588	612	83.92	5	5	2	1	5	1
49	499	494	75.59	3	2	4	2	1	5
50	557	633	77.79	5	1	3	4	1	4
51	521	536	74.50	3	2	3	3	3	5
52	634	632	72.85	-	-	-	-	-	-
53	605	674	77.62	3	1	3	4	3	4
54	679	640	76.13	4	4	3	2	5	1
55	605	690	82.36	4	3	3	2	3	3
56	669	749	76.72	5	3	3	3	3	1
57	---	---	---	-	-	-	-	-	-
58	549	556	72.98	3	2	2	3	3	5
59	676	699	89.46	5	1	4	3	1	3
60	584	715	86.86	5	3	3	2	3	2
61	626	623	73.35	5	1	5	3	1	3
62	661	652	75.53	4	1	4	5	2	3
63	659	506	78.12	5	2	3	2	2	4

TABLE A-1 (cont'd.)

Student Teacher	Opinion Attitude Interest Survey													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	05	77	46	96	98	84	47	53	76	02	14	48	75	35
2	00	50	13	34	33	87	99	73	20	71	00	86	27	40
3	31	35	52	34	33	58	36	65	36	20	66	38	08	35
4	07	09	48	86	93	45	08	49	30	20	02	09	84	58
5	48	50	24	44	45	40	71	94	05	38	10	93	22	58
6	35	77	75	89	86	40	59	10	81	10	50	26	51	11
7	82	77	29	60	33	64	71	26	97	38	27	63	15	14
8	19	42	08	66	39	35	53	97	13	18	27	53	27	63
9	00	93	24	89	45	90	94	23	03	05	61	22	51	76
10	13	50	87	89	99	64	13	73	95	00	32	38	95	11
11	13	27	29	55	95	58	71	41	81	03	10	48	57	25
12	13	42	29	34	91	05	91	29	76	12	03	22	33	21
13	53	35	13	83	89	96	19	76	66	05	71	63	15	25
14	44	27	08	94	39	21	81	53	17	33	32	26	03	72
15	03	35	70	83	57	92	94	69	13	17	61	83	39	90
16	11	81	34	91	89	80	13	41	47	01	93	68	01	11
17	19	09	75	55	91	30	76	57	85	66	18	91	15	02
18	19	27	64	97	86	45	22	23	17	14	18	26	62	52
19	35	27	58	96	89	03	76	20	54	06	38	58	57	46
20	05	03	10	44	63	40	96	98	25	24	03	86	62	58
21	53	58	75	93	33	04	71	16	13	56	14	26	27	40
22	53	27	95	13	96	64	81	41	95	14	61	38	27	03
23	09	20	13	83	97	58	88	69	07	14	44	72	51	68
24	09	27	20	83	96	40	22	73	06	38	66	72	06	17
25	35	06	83	79	69	25	81	53	06	24	07	63	39	72
26	19	20	06	94	97	98	41	96	60	10	94	93	15	11
27	22	93	52	94	91	25	13	20	60	10	27	43	75	35
28	06	09	70	71	96	94	41	73	20	08	79	89	05	30
29	53	20	70	93	79	25	41	12	13	12	50	18	39	46
30	58	09	46	60	91	17	96	82	66	20	18	76	18	46
31	58	27	24	75	89	94	71	90	71	06	79	96	18	17
32	13	50	46	79	89	11	41	61	04	33	22	18	62	58
33	04	06	46	39	89	70	31	49	09	00	71	48	06	35
34	40	42	29	83	74	99	88	85	42	00	75	72	22	14
35	06	20	34	50	45	04	71	76	54	71	00	38	62	63
36	35	27	87	44	69	51	13	53	91	14	00	14	89	63
37	13	93	64	83	93	92	65	23	28	04	50	14	67	76
38	13	88	34	93	83	80	76	33	93	28	38	76	51	68
39	11	85	34	29	79	04	47	65	60	44	07	68	15	17
40	20	85	95	34	51	21	31	00	54	04	93	07	08	30
41	19	09	03	89	39	90	26	79	55	01	38	43	67	46

TABLE A-1 (cont'd.)

Student Teacher	Opinion Attitude Interest Survey													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
42	13	20	06	86	69	64	53	98	22	66	22	91	33	25
43	40	81	93	79	86	90	13	33	47	56	83	86	22	00
44	44	14	06	83	74	92	71	45	71	12	66	76	22	40
45	53	71	24	91	91	03	31	20	76	33	10	06	81	25
46	--	--	--	--	--	--	--	--	--	--	--	--	--	--
47	06	88	08	89	89	80	08	76	40	00	03	09	97	76
48	04	50	29	60	96	95	41	88	91	02	32	48	57	35
49	26	27	24	86	28	07	71	90	04	12	27	18	62	99
50	19	09	58	83	91	80	10	29	28	00	14	05	89	63
51	07	65	64	93	86	00	41	33	13	50	07	18	08	52
52	--	--	--	--	--	--	--	--	--	--	--	--	--	--
53	02	71	79	39	99	87	47	29	20	14	44	80	78	03
54	03	35	10	17	86	93	76	76	16	17	07	86	33	17
55	35	50	70	79	57	07	81	49	55	24	22	04	78	80
56	53	35	95	03	93	84	41	37	71	33	75	98	02	01
57	11	06	03	60	91	94	41	94	76	03	18	48	91	46
58	92	71	46	50	89	45	81	37	30	05	44	72	27	68
59	06	09	70	29	99	96	59	73	54	24	44	86	75	11
60	71	03	52	79	89	30	19	49	47	20	66	63	27	05
61	05	27	52	44	97	84	47	92	67	04	32	76	27	21
62	40	50	64	44	79	51	71	26	25	24	32	22	33	14
63	48	50	79	75	51	25	06	05	36	17	86	03	71	14

TABLE A-2

STATISTICS ON SELECTED CHARACTERISTICS OF SCIENCE STUDENT
TEACHERS AT CORNELL UNIVERSITY IN THE FALL SEMESTER
OF 1965-1966

Student Teacher	S.A.T. at Entrance		Cumulative 3rd Year Average	Allport Vernon Lindzey Study of Values					
	V	M		Th.	Ec.	Ae.	So.	Po.	Re.
1	634	632	72.85	-	-	-	-	-	-
2	605	674	77.62	3	1	3	4	3	4
3	679	646	76.13	4	4	3	2	5	1
4	605	696	82.36	4	3	3	2	3	3
5	669	749	76.72	5	3	3	3	3	1
6	---	---	---	-	-	-	-	-	-
7	549	556	72.98	3	2	2	3	3	5
8	676	699	89.46	5	1	4	3	1	3
9	584	715	86.86	5	3	3	2	3	2
10	626	623	73.53	5	1	5	3	1	3
11	661	652	75.53	4	1	4	5	2	3
12	659	506	78.12	5	2	3	2	2	4

TABLE A-2 (cont'd.)

Opinion Attitude Interest Survey														
Student Teacher	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	02	71	79	39	99	87	47	29	20	14	44	80	78	03
3	03	35	10	17	86	93	76	76	16	17	07	86	33	17
4	35	50	70	79	57	07	81	49	55	24	22	04	78	80
5	53	35	95	03	93	84	41	37	71	33	75	98	02	01
6	11	06	03	60	91	94	41	94	76	03	18	48	91	46
7	92	71	46	50	89	45	81	37	30	05	44	72	27	68
8	06	09	70	29	99	96	59	73	54	24	44	86	75	11
9	71	03	52	79	89	30	19	49	47	20	66	63	27	05
10	05	27	52	44	97	84	47	92	67	04	32	76	27	21
11	40	50	64	44	79	51	71	26	25	24	32	22	33	14
12	48	50	79	75	51	25	06	05	36	17	86	03	71	14

APPENDIX B

POST MEETING REACTION SHEET WITH NUMBER OF RESPONSES
ENTERED ABOVE THE APPROPRIATE RATING FOR EACH ITEM

POST MEETING REACTION SHEET

YOUR GENERAL REACTIONS TO THE CLASSROOM INTERACTION ANALYSIS:
Please indicate how much you value the various activities
related to classes on interaction analysis as listed below.

DIRECTIONS

Check one rating,
between 10 and 1,
for each item un-
less you have no
evidence, in
which case check
the extreme right
hand column

	HIGHEST VALUE					LOWEST VALUE					No Evi- dence
	Out- standing		Excel- lent		Good	Aver- age		Poor			
	10	9	8	7	6	5	4	3	2	1	0
1. Role playing			3	1	2	1	2	2			
2. Filmstrips or tape recordings			2	1	2		3	1	1		1
3. Lectures and talks given by the instructor				3	4	1	3				
4. Group discus- sions that were part of the regular sessions			2	2	2	2	2	1			
5. Discussions with fellow teachers about inter- action analysis during the week	1		1	1		1	2		2	1	2
6. Your own experi- mentation in the classroom based on these classes				1	1		3		1		5
7. Compared with an equal amount of time in an aver- age education course, I would rate these classes as:				2	1		3	3	2		
8. I would rate the experiences in terms of helping me with my own teaching as:				1	1		1	4	4		

WHAT HAPPENS VERSUS WHAT YOU WOULD HAVE LIKED

All the items listed below refer to the lectures as a whole and require two answers. The first answer indicates your appraisal of what happened, without regard to whether you like it or not. The second answer indicates what you would have preferred without regard to what actually happened. REMEMBER, THE FIRST INDICATES WHAT HAPPENED, THE SECOND INDICATES WHAT YOU WOULD HAVE PREFERRED.

1. Assuming that "very theoretical" is the opposite of "very practical," how would you rate the sessions? More theoretical? More practical?

a) Mark your appraisal as you saw it.

1/	1/	1/	1/	2/	3/	/	1/	/	1/
10	9	8	7	6	5	4	3	2	1

very theoretical		very practical
------------------	--	----------------

b) Now indicate what you would have preferred.

/	/	/	1/	/	/	2/	4/	1/	3/
10	9	8	7	6	5	4	3	2	1

very theoretical		very practical
------------------	--	----------------

2. Assuming that the approach to ideas or problems before our group could be determined either by the instructor or by the student teachers participating, where did the approach come from in general?

a) Mark your appraisal as you saw it.

3/	5/	1/	2/	/	/	/	/	/	/
10	9	8	7	6	5	4	3	2	1

from the
instructor

from the
teachers

b) Now indicate what you would have preferred.

/	1/	/	1/	1/	2/	2/	1/	1/	2/
10	9	8	7	6	5	4	3	2	1

from the
instructor

from the
teachers

3. Assuming that we could emphasize content (ideas about teaching) or we could emphasize attitudes (our feelings about these ideas), how would you rate the sessions?

a) Mark your appraisal as you saw it.

/	1/	3/	4/	/	2/	1/	/	/	/
10	9	8	7	6	5	4	3	2	1

mostly ideas

mostly attitudes

b) Now indicate what you would have preferred.

1/	3/	/	2/	1/	2/	2/	/	/	/
10	9	8	7	6	5	4	3	2	1

mostly ideas

mostly attitudes

4. Assuming that the flow of ideas can move too fast for adequate understanding and, at other times, too slow for sustained interest, how did this aspect of our work appear to you?

a) Mark your appraisal as you saw it.

/	/	/	/	1/	/	4/	3/	3/	/
10	9	8	7	6	5	4	3	2	1

much too fast

much too slow

b) Now indicate what you would have preferred.

/	1/	/	3/	6/	1/	/	/	/	/
10	9	8	7	6	5	4	3	2	1

much too fast

much too slow

5. Assuming that some of the time the instructor controls the activities and at other times this control can be shared or given exclusively to the student teachers participating, what kind of balance occurred generally?

a) Mark your appraisal as you saw it.

2/	/	3/	4/	/	1/	/	1/	/	/
10	9	8	7	6	5	4	3	2	1

instructor
directed

teacher
directed

b) Now indicate what you would have preferred.

/	/	/	1/	2/	4/	2/	1/	/	/
10	9	8	7	6	5	4	3	2	1

instructor
directed

teacher
directed

6. Assuming that your relationships with the instructor could be considered "formal and impersonal" versus "informal and personal," how would you characterize these relationships?

a) Mark your appraisal as you saw it.

/	/	/	/	1/	/	2/	3/	4/	1/
10	9	8	7	6	5	4	3	2	1

very formal

very informal

b) Now indicate what you would have preferred.

/	/	/	/	1/	1/	2/	2/	5/	/
10	9	8	7	6	5	4	3	2	1

very formal

very informal

7. Assuming that your own motivation for participating could come either from the instructor's stimulation or from self-generated curiosity, what motivated you?

a) Mark your appraisal as you saw it.

2/	/	2/	1/	1/	1/	2/	1/	1/	/
10	9	8	7	6	5	4	3	2	1

mostly
instructor

mostly
self

b) Now indicate what you would have preferred.

/	/	/	/	/	3/	4/	/	2/	2/
10	9	8	7	6	5	4	3	2	1

mostly
instructor

mostly
self

8. Sometimes people feel free to "speak out" during meetings, and sometimes people feel restrained against expressing their ideas and feelings. Did you feel free to say what you wanted, or did you feel held back?

a) Mark your appraisal as you saw it.

1/	/	/	/	/	/	/	1/	1/	1/	7/
10	9	8	7	6	5	4	3	2	1	

not free
enough

free
enough

b) Now indicate what you would have preferred.

/	/	/	/	/	/	/	1/	1/	2/	7/
10	9	8	7	6	5	4	3	2	1	

not free
enough

free
enough

9. Assuming that any progress you may have made could be due to instruction or to your own determination, how would you rate these sessions?

a) Mark your appraisal as you saw it.

1/	1/	/	1/	2/	2/	1/	1/	1/	1/
10	9	8	7	6	5	4	3	2	1

instruction

self-determination

b) Now indicate what you would have preferred.

/	/	/	2/	1/	6/	/	1/	1/	/
10	9	8	7	6	5	4	3	2	1

instruction

self-determination

PLEASE FEEL FREE TO ADD ANY COMMENTS ABOUT THE SESSIONS ON THE BACK OF THIS SHEET.

APPENDIX C

SELECTED SCORES BASED ON THE STUDENT TEACHING
SEMINARS ON THE FLANDERS SYSTEM OF
INTERACTION ANALYSIS

TABLE C-1

ORIGINAL SCORES OF SELECTED ASPECTS OF TEACHER TALK BASED
ON THE SEMINAR MATRIX

Variable	Score	Variable	Score
T accepts feelings	0	T directions/ T talk	1.4
T praise and encouragement	.7	T criticism/ T talk	0
T accepts ideas	2.1	Content	59.33
T questions	5.0	Extended T accepts feeling	0
T lectures	54.3	Extended T praise	0
T directions	.9	Extended T accepts ideas	.08
T criticism	0	Extended T asks questions	.89
T talk	71.32	Extended T lectures	41.40
T accepts feelings/ T talk	0	Extended T directions	.66
T praise/T talk	1.1	Extended T criticism	0
T accepts ideas/ T talk	3.4	Total T steady state	56.73
T asks questions/ T talk	8.0		
T lectures/ T talk	86.1		

TABLE C-2

ORIGINAL SCORES OF SELECTED ASPECTS
OF STUDENT TALK BASED ON THE
SEMINAR MATRIX

Variable	Score
S response	2.1
S initiated	23.3
S talk	25.34
Extended S response	.12
Extended S initiated	10.90

TABLE C-3

ORIGINAL SCORES OF SELECTED ASPECTS
OF VERBAL INTERACTION ASSOCIATED
WITH INDIRECTNESS-DIRECTNESS
BASED ON THE SEMINAR MARRIX

Variable	Score
I/I+D	12.50
Revised I/I+D	76.84
Row 8-9 I/I+D	34.96
Revised Row 8 I/I+D	93.33
Revised Row 9 I/I+D	98.11
Area A	.12
Area B	1.05

TABLE C-4

ORIGINAL SCORES OF SELECTED ASPECTS OF VERBAL
INTERACTION FOLLOWING STUDENT TALK BASED
ON THE SEMINAR MATRIX

Variable	Score
T accepts feeling following S talk	0
T praises following S talk	2.76
T accepts ideas following S talk	7.35
T questions following S talk	4.13
T lectures following S talk	26.19
T directions following S talk	.31
T criticism following S talk	0
S response following S talk	.46
S initiated following S talk	43.34
Silence following S talk	15.47
S initiated/S talk	91.88

TABLE C-5
ORIGINAL SCORES OF SELECTED ASPECTS OF
"SILENCE OR CONFUSION" BASED ON
THE SEMINAR MATRIX

Variable	Score
Silence following T accepts feeling	0
Silence following T praise	0
Silence following T accepts ideas	1.00
Silence following T questions	8.33
Silence following T lecture	34.00
Silence following T directions	0
Silence following T criticism	0
Silence following S response	2.67
Silence following S initiated	31.00
Extended silence/silence	23.00
Total silence	11.6
Extended silence	2.68

APPENDIX D

SUMMED MATRICES OF THE OBSERVATIONS OF STUDENT TEACHERS
AT PHASE ONE, PHASE TWO, AND PHASE THREE, AND OF THE
TOTAL OBSERVATIONS OF THE COOPERATING TEACHERS
IN THE EXPERIMENTAL GROUP¹

¹See Matthews (1965) for Summed Matrix for the
Observations of the Control Group.

TABLE D-1

SUMMED MATRIX¹ REPRESENTING ALL STUDENT TEACHERS IN
EXPERIMENTAL GROUP FOR PHASE ONE

Category	1	2	3	4	5	6	7	8	9	10
1. T Accepts Feeling	0	0	0	0	0	0	0	0	0	0
2. T Praises	0	4	11	19	22	4	1	43	12	12
3. T Accepts	0	12	205	234	210	16	0	51	40	122
4. T Asks Questions	0	6	3	379	117	8	2	955	167	385
5. T Lectures	0	3	12	538	5986	89	15	128	427	712
6. T Gives Directions	0	0	0	18	38	279	2	31	17	143
7. T Gives Criticism	0	0	0	4	25	4	28	11	10	48
8. S Talk/ Response	0	70	518	259	291	17	12	980	21	148
9. S Talk/ Initiated	0	28	113	117	440	22	7	2	306	153
10. Silence/ Confusion	0	5	28	454	781	89	63	115	188	2114
Total	0	128	890	2022	7910	528	130	2316	1188	3837
Percent	0	.7	4.7	10.7	41.7	2.8	.7	12.2	6.3	20.2

¹Total number of tallies = 18949.

TABLE D-2

SUMMED MATRIX¹ REPRESENTING ALL STUDENT TEACHERS IN
EXPERIMENTAL GROUP FOR PHASE TWO

Category	1	2	3	4	5	6	7	8	9	10
1. T Accepts Feeling	0	0	0	0	0	0	0	0	0	0
2. T Praises	0	0	1	6	3	0	0	12	6	1
3. T Accepts	0	1	148	291	231	9	2	22	38	115
4. T Asks Questions	0	0	3	287	63	7	2	875	166	310
5. T Lectures	0	2	4	465	6005	51	28	25	527	710
6. T Gives Directions	0	0	0	5	35	182	0	7	20	70
7. T Gives Criticism	0	0	0	12	24	7	44	4	8	44
8. S Talk/ Response	0	15	437	183	151	7	5	179	17	70
9. S Talk/ Initiated	0	9	148	132	522	9	11	0	560	145
10. Silence/ Confusion	0	2	16	332	783	47	51	40	194	1595
Total	0	29	857	1713	7817	319	143	1164	1536	3060
Percent	0	.2	5.2	10.3	47.0	1.9	.9	7.0	9.2	18.4

¹Total number of tallies = 16638.

TABLE D-3

SUMMED MATRIX¹ REPRESENTING ALL STUDENT TEACHERS IN
EXPERIMENTAL GROUP FOR PHASE THREE

Category	1	2	3	4	5	6	7	8	9	10
1. T Accepts Feeling	0	0	0	0	0	0	0	0	0	0
2. T Praises	0	0	0	2	2	0	0	3	10	0
3. T Accepts	0	0	223	279	301	21	3	67	71	101
4. T Asks Questions	0	0	2	327	85	7	1	913	131	371
5. T Lectures	0	0	5	547	7051	89	16	56	679	658
6. T Gives Directions	0	0	1	12	34	244	2	44	21	104
7. T Gives Criticism	0	0	1	3	17	2	47	8	14	52
8. S Talk/ Response	0	4	619	213	195	20	7	547	19	114
9. S Talk/ Initiated	0	13	197	124	629	9	8	2	548	170
10. Silence/ Confusion	0	0	18	330	787	70	60	98	207	1513
Total	0	17	1066	1837	9101	462	144	1738	1700	3083
Percent	0	.1	5.6	9.6	47.5	2.4	.8	9.1	8.9	16.1

¹Total number of tallies = 19148.

TABLE D-4

SUMMED MATRIX¹ REPRESENTING ALL COOPERATING TEACHERS FOR
THE EXPERIMENTAL GROUP

Category	1	2	3	4	5	6	7	8	9	10
1. T Accepts Feeling	0	0	0	0	0	0	0	0	0	0
2. T Praises	0	1	0	0	5	0	0	27	18	2
3. T Accepts	0	6	177	598	888	32	6	108	80	179
4. T Asks Questions	0	1	4	1259	447	32	7	2737	260	1145
5. T Lectures	0	4	12	2127	29466	291	39	219	1723	2349
6. T Gives Directions	0	0	0	34	137	429	1	70	56	328
7. T Gives Criticism	0	1	0	11	52	9	38	8	10	59
8. S Talk/ Response	0	21	1648	704	802	28	13	1153	23	286
9. S Talk/ Initiated	0	17	194	309	1683	25	18	3	1454	374
10. Silence/ Confusion	0	2	39	850	2750	209	66	343	453	4284
Total	0	53	2074	5892	36230	1055	188	4678	4077	9006
Percent	0	.1	3.3	9.3	57.3	1.7	.3	7.4	6.4	14.2

¹ Total number of tallies = 63,253.

APPENDIX E

MEDIANS AND RANGES OF THE SCORES OBTAINED BY THE EXPERI-
MENTAL, CONTROL, AND COOPERATING TEACHER GROUPS ON THE
SELECTED ASPECTS OF VERBAL INTERACTION
USED IN THIS STUDY

TABLE E-1

ORIGINAL SCORES OBTAINED BY STUDENT TEACHERS IN THE
EXPERIMENTAL AND THE CONTROL GROUPS AT PHASE ONE

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0-0	0	0- .43	0
T praise and encouragement	.64	0- 2.96	.09	0- 1.63	+.51
T accepts ideas	4.07	2.88- 8.09	3.93	1.31- 9.30	+.14
T questions	10.75	5.38-16.29	11.30	3.03-23.40	-.55
T lectures	40.41	23.47-73.59	51.77	36.46-73.27	-11.36
T directions	2.86	.29- 5.59	1.67	.48- 6.98	+1.19
T criticism	.65	0- 2.55	.46	0- 2.11	+.19
T talk	75.53	62.13-91.59	80.19	72.56-92.38	-4.66
T accepts feelings/ T talk	0	0-0	0	0- .62	0
T praise/ T talk	1.09	0- 6.57	.12	0- 2.37	+.97
T accepts ideas/ T talk	7.23	3.74-13.57	5.61	1.72-13.02	+1.62
T asks questions/ T talk	19.37	7.85-27.30	14.70	5.12-30.16	+4.67
T lectures/ T talk	66.17	43.30-87.33	74.75	51.02-89.15	-8.58
T directions/ T talk	5.18	.45- 9.91	2.24	.62- 8.76	+2.94

TABLE E-1 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism/ T talk	1.04	0- 5.67	.63	0- 2.90	+.41
Content	51.91	33.20-80.20	65.31	54.06-80.50	-13.40
Extended T accepts feeling	0	0	0	0- .17	0
Extended T praise	0	0- .11	0	0	0
Extended T accepts ideas	.96	0- 2.46	.20	0- 2.09	+.76
Extended T asks questions	1.59	1.08- 3.06	2.01	.21- 8.05	-.42
Extended T lecture	29.82	12.63-65.42	40.39	26.42-65.94	-10.57
Extended T directions	1.53	.10- 3.44	.80	.09- 5.12	+.73
Extended T criticism	.11	0- .67	0	9- .71	+.11
Total T steady state	52.96	40.25-72.47	55.47	32.85-74.69	-1.51
S response	10.92	4.16-28.46	10.27	2.49-16.68	-.65
S initiated	5.24	1.13-18.55	5.21	.87-13.51	+.03
S talk	18.29	7.74-34.64	17.70	6.57-24.17	+.59
Extended S response	4.05	.27-15.93	2.12	.04- 4.86	+1.93
Extended S initiated	.96	.19- 6.24	1.58	.24- 5.63	-.62

TABLE E-1 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
I/I+D	28.44	11.59-42.78	21.81	6.23-45.07	+6.63
Revised I/I+D	60.29	30.06-91.57	62.09	16.13-90.78	-1.80
Row 8-9 I/I+D	56.86	41.35-83.66	56.74	18.96-77.58	+.12
Revised Row 8 I/I+D	96.68	82.26-99.99	94.19	81.54-99.99	+2.49
Revised Row 9 I/I+D	85.03	0-99.99	80.95	0-99.99	+4.08
Area A	1.91	0- 4.59	.31	0- 3.05	+1.60
Area B	2.65	.22- 7.13	1.27	.12- 6.78	+1.38
T accepts feeling following S talk	0	0	0	0- .61	0
T praises following S talk	1.69	0-12.94	.13	0- 3.72	+1.56
T accepts ideas following S talk	15.07	6.68-42.41	21.60	6.74-42.82	-6.53
T questions following S talk	11.05	6.88-21.31	10.94	3.51-28.34	+.11
T lectures following S talk	20.02	8.93-28.75	24.28	12.09-49.56	-4.27
T directions following S talk	.60	0- 4.64	.61	0- 2.55	-.01

TABLE E-1 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism following S talk	.45	0- 1.69	1.28	0- 4.63	-.84
S response following S talk	25.75	3.45-57.22	12.67	.49-26.25	+13.08
S initiated following S talk	8.14	1.26-28.26	10.56	2.67-30.41	-2.42
Silence following S talk	6.83	2.76-17.01	7.26	0-27.44	-.43
S initiated/ S talk	30.59	7.55-80.34	36.17	27.28-64.94	-5.58
Silence following T accepts feeling	0	0	0	0- .50	0
Silence following T praise	.26	0- 2.04	0	0- 1.82	+.26
Silence following T accepts ideas	3.00	1.26- 6.21	1.48	0- 5.76	+1.52
Silence following T questions	9.68	2.09-25.26	17.46	3.73-56.84	-7.78
Silence following T lecture	19.03	10.88-30.67	15.58	9.01-43.59	+3.45
Silence following T directions	3.06	.66-10.20	4.03	.85-15.45	-.97

TABLE E-1 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following T criticism	.68	0- 4.60	.64	0- 4.05	+.04
Silence following S response	3.48	0-11.44	7.11	0-23.89	-3.63
Silence following S initiated	3.58	.60- 8.80	6.42	0-20.15	-2.84
Extended silence/silence	55.57	29.59-73.22	37.36	12.82-64.36	+18.21
Total silence	20.92	8.00-32.12	10.21	3.39-14.59	+10.71
Extended silence	12.15	2.52-23.52	3.49	.43- 8.89	+8.66

TABLE E-2

ORIGINAL SCORES OBTAINED BY STUDENT TEACHERS IN THE
EXPERIMENTAL AND THE CONTROL GROUPS AT PHASE TWO

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0-0	0	0- .05	0
T praise and encouragement	.16	0- 2.96	.08	0- .82	+.08
T accepts ideas	4.90	2.95- 7.17	3.81	0- 6.59	+1.09
T questions	9.62	4.50-15.82	11.23	1.24-15.60	-1.61
T lectures	48.95	25.98-68.88	56.89	36.46-73.27	-7.94
T directions	1.89	.25- 5.90	1.77	.19-11.31	+.12
T criticism	.89	0- 1.84	.91	.05- 3.99	-.02
T talk	80.23	63.33-92.03	81.70	68.85-94.41	-1.47
T accepts feelings/ T talk	0	0-0	0	0- .07	0
T praise/ T talk	.24	0- .76	.10	0- 1.08	+.14
T accepts ideas/T talk	7.66	4.28-13.02	4.85	0- 8.93	+2.81
T asks questions/ T talk	13.55	5.69-29.33	14.89	1.53-21.73	-1.34
T lectures/ T talk	73.16	50.44-87.17	75.99	57.63-87.83	-2.83
T directions/ T talk	3.36	.34- 8.92	2.30	.26-14.84	+1.06
T criticism/ T talk	1.33	0- 2.91	1.19	.07- 5.66	+.14

TABLE E-2 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Content	57.11	41.08-73.38	67.15	52.63-77.92	-10.04
Extended T accepts feeling	0	0	0	0	0
Extended T praise	0	0	0	0- .16	0
Extended T accepts ideas	.77	0- 2.01	0	0- .95	+.77
Extended T asks questions	1.61	.56- 3.39	2.84	.15- 6.44	-1.23
Extended T lectures	36.95	16.34-59.38	45.90	29.62-71.87	-8.95
Extended T directions	.92	.10- 4.23	.57	0- 5.81	+.35
Extended T criticism	.11	0- 1.58	0	0- 1.83	+.11
Total T steady state	55.68	39.01-70.91	59.74	42.88-87.48	-4.06
S response	6.46	3.30-12.63	9.73	.77-13.58	-3.27
S initiated	9.28	3.04-18.58	6.15	1.29-15.32	+3.13
S talk	16.21	6.84-29.82	16.15	5.16-26.83	+.06
Extended S response	.67	.27- 3.71	1.95	.29- 4.59	-1.28
Extended S initiated	2.89	.40-11.33	1.90	.39- 5.38	+.99
I/I+D	22.08	10.02-43.11	20.23	1.91-29.00	+1.85

TABLE E-2 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Revised I/I+D	63.91	31.90-95.69	57.80	0-95.38	+6.11
Row 8-9 I/I+D	65.20	31.91-72.44	46.02	9.52-64.29	+19.18
Revised Row 8 I/I+D	98.11	94.44-99.99	90.25	0-99.99	+7.86
Revised Row 9 I/I+D	93.73	65.00-99.99	55.06	0-99.99	+38.67
Area A	1.19	0- 2.83	.15	0- 1.29	+1.04
Area B	2.20	.14- 6.51	.90	0- 8.55	+1.30
T accepts feeling following S talk	0	0	0	0	0
T praises following S talk	.45	0- 2.29	0	0- 2.73	+.45
T accepts ideas following S talk	28.54	11.38-48.57	18.79	0-35.04	+9.75
T questions following S talk	11.75	6.48-15.66	9.49	1.79-22.22	+2.26
T lectures following S talk	22.75	14.41-44.97	30.20	18.48-46.72	-7.45
T directions following S talk	.42	0- 2.70	.98	0- 7.61	-.56

TABLE E-2 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism following S talk	.25	0- 1.77	2.03	0- 9.49	-1.78
S response following S talk	6.30	1.85-14.14	13.53	1.64-27.98	-7.23
S initiated following S talk	17.55	4.00-38.86	12.57	2.88-58.93	+4.98
Silence following S talk	7.99	2.84-16.67	6.09	0-18.51	+1.90
S initiated/ S talk	55.83	34.86-78.77	38.73	25.00-91.07	+17.10
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0- .32	0	0	0
Silence following T accepts ideas	3.51	1.96-10.00	1.02	0- 8.54	+2.49
Silence following T questions	8.98	3.33-14.71	14.03	2.99-30.86	-5.05
Silence following T lecture	22.83	14.98-41.70	19.40	7.46-38.00	+3.43
Silence following T directions	2.55	.59- 5.88	4.30	0-13.21	-1.75

TABLE E-2 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following T criticism	1.20	0- 3.14	1.02	0- 9.43	+1.18
Silence following S response	2.25	1.10-16.67	6.30	0-17.03	-4.05
Silence following S initiated	4.42	.45-21.30	5.64	0-18.78	-1.22
Extended silence/silence	52.31	28.26-63.76	42.99	24.18-82.09	+9.32
Total silence	18.01	7.98-29.77	9.06	4.34-13.87	+8.95
Extended silence	9.56	3.19-16.52	4.02	1.05- 8.50	+5.54

TABLE E-3

ORIGINAL SCORES OBTAINED BY STUDENT TEACHERS IN THE
EXPERIMENTAL AND THE CONTROL GROUPS AT PHASE THREE

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0-0	0	0- .06	0
T praise and encouragement	.07	0- .35	.07	0- 2.01	0
T accepts ideas	4.73	2.62-11.97	3.32	10.00- 7.78	+1.41
T questions	9.49	4.83-14.08	8.53	4.36-21.13	+.96
T lectures	46.90	23.84-62.99	61.73	40.74-76.90	-14.83
T directions	2.02	.17- 8.58	1.94	.07- 7.32	+.08
T criticism	.67	0- 4.14	.58	0- 2.53	+.09
T talk	77.52	68.88-88.97	83.54	73.88-92.06	-6.02
T accepts feelings/ T talk	0	0-0	0	0- 0.08	0
T praise/ T talk	.09	0- .58	.11	0- 2.74	+.09
T accepts ideas/ T talk	7.16	3.36-20.99	4.15	.12- 9.91	+3.01
T asks questions/ T talk	14.51	8.37-20.33	10.32	5.27-31.35	+4.19
T lectures/ T talk	72.71	41.80-82.09	78.55	57.32-89.69	-5.84
T directions/ T talk	3.11	.26-11.00	2.31	.09- 8.99	+.80
T criticism/ T talk	1.01	0- 5.30	.71	0- 3.09	+.30

TABLE E-3 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Content	56.42	37.93-70.75	70.50	59.66-81.98	-14.08
Extended T accepts feeling	0	0	0	0	0
Extended T praise	0	0	0	0- .77	0
Extended T accepts ideas	.71	.15- 3.24	.09	0- 1.51	+.62
Extended T asks questions	1.54	1.02- 2.49	2.38	0- 8.40	-.84
Extended T lectures	34.90	15.29-55.90	52.62	29.08-72.17	-17.72
Extended T directions	1.01	0- 6.26	.81	0- 5.76	+.20
Extended T criticism	.11	0- 3.33	0	0- 2.12	+.11
Total T steady state	53.47	36.12-72.13	65.89	45.74-82.84	-12.42
S response	7.20	3.32-20.44	6.95	3.32-15.87	+.25
S initiated	7.60	4.04-16.25	7.15	3.29-10.58	+.45
S talk	17.88	9.28-26.71	15.74	7.55-23.02	+.214
Extended S response	1.06	.52- 9.67	1.39	0- 5.74	-.33
Extended S initiated	2.41	1.02- 5.82	2.68	.44- 6.62	-.27
I/I+D	21.93	12.42-45.68	15.50	8.02-40.11	+6.43
Revised I/I+D	65.40	17.11-97.17	51.76	2.44-91.95	+13.64

TABLE E-3 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Row 8-9 I/I+D	56.52	39.47-77.17	47.78	25.20-68.00	+8.74
Revised Row 8 I/I+D	96.55	88.89-99.99	92.78	50.00-99.99	+3.77
Revised Row 9 I/I+D	93.13	50.00-99.99	62.50	0-99.99	+30.63
Area A	.98	.9- 5.24	.15	0- 2.17	+.83
Area B	1.72	0-12.29	1.19	0- 6.97	+.53
T accepts feeling following S talk	0	0	0	0- .28	0
T praises following S talk	.52	0- 1.64	0	0- 3.01	+.52
T accepts ideas fol- lowing S talk	25.07	9.96-44.53	20.97	1.33-45.48	+4.10
T questions following S talk	10.94	7.19-16.30	6.36	3.27-24.00	+4.58
T lectures following S talk	26.68	13.94-34.70	26.91	17.41-50.57	-.23
T directions following S talk	.68	0- 1.82	.34	0- 1.99	+.54
T criticism following S talk	.50	0- 1.31	1.56	0- 6.10	-1.06

TABLE E-3 (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
S response following S talk	10.77	2.94-36.33	8.03	0.25-.63	+2.74
S initiated following S talk	16.30	4.69-33.66	18.09	5.16-42.99	-1.79
Silence following S talk	8.30	3.13-16.09	5.76	1.40-22.97	+2.54
S initiated/ S talk	46.51	23.46-81.37	49.41	27.28-64.94	-2.90
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0	0	0- 3.09	0
Silence following T accepts ideas	3.30	.45-11.70	.96	0- 5.56	+2.34
Silence following T questions	14.54	3.33-22.22	14.81	0-31.03	-.27
Silence following T lecture	20.95	11.11-31.16	17.62	9.28-38.96	+3.33
Silence following T directions	3.24	.56-11.90	4.66	0-13.40	-1.42
Silence following T criticism	1.88	0- 3.51	0	0- 8.33	+1.88

TABLE E-3 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following S response	3.30	1.59--6.85	6.91	2.00-22.22	-3.61
Silence following S initiated	3.03	1.17-13.90	6.22	1.85-24.78	-3.19
Extended silence/silence	45.73	35.27-66.21	41.73	13.79-52.90	+4.00
Total silence	16.65	10.61-24.45	5.27	1.89-19.27	+11.38
Extended silence	7.59	4.07-13.50	2.13	.41-10.19	+5.46

TABLE E-4

ORIGINAL SCORES OBTAINED BY THE "DIRECT COOPERATING
TEACHER" GROUP AT PHASE ONE

Variable	Experimental Group		Control Group		Dif- ference
	Median	Range	Median	Range	(E-C)
T accepts feelings	0	0	0	0	0
T praise and encouragement	.08	0- .61	.04	0- .70	+.04
T accepts ideas	3.65	2.88- 6.70	3.15	1.37- 6.08	+.50
T questions	8.30	6.62-13.75	7.85	5.38-23.46	+.45
T lectures	42.38	30.20-73.59	59.77	43.94-73.27	-17.39
T directions	4.01	.69- 5.59	2.03	.52- 6.98	+1.98
T criticism	.33	.21- 1.24	.60	.14- 1.89	-.27
T talk	78.67	62.13-91.59	86.16	74.74-92.38	-77.49
T accepts feelings/ T talk	0	0	0	0	0
T praises/ T talk	.12	0- 1.07	.05	0- .95	+2.05
T asks questions/ T talk	14.06	7.85-24.20	10.04	6.99-30.16	+4.02
T lectures/ T talk	71.57	53.14-87.33	77.80	12.13-89.06	-6.23
T directions/ T talk	7.06	.82- 9.07	2.87	.62- 8.76	+4.19
T criticism/ T talk	.57	.25- 2.02	.74	.17- 2.57	-.14

TABLE E-4 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Content	50.68	43.95-80.20	69.27	60.01-80.50	-18.59
Extended T accepts feeling	0	0	0	0	0
Extended T praise	0	0	0	0	0
Extended T accepts ideas	.90	.37- 1.31	.06	0- 2.09	+.84
Extended T asks questions	1.29	1.16- 1.57	1.73	1.04- 7.80	-.44
Extended T lectures	31.03	19.93-65.42	50.42	34.89-65.94	-19.39
Extended T directions	2.08	.27- 3.44	.81	.17- 5.12	+1.27
Extended T criticism	.02	0- .51	.05	0- .50	-.03
Total T steady state	55.34	44.82-72.47	63.65	48.51-74.69	-8.31
S response	10.06	4.16-28.40	7.86	3.49-13.86	+2.20
S initiated	5.23	3.58- 7.72	5.13	.87-10.27	+.10
S talk	16.06	7.74-18.76	12.97	6.57-22.72	+3.09
Extended S response	4.05	.27-15.93	1.83	.04- 3.31	+2.22
Extended S initiated	.96	.90- 1.47	1.31	.24- 4.88	-.35
I/I+D	20.15	11.59-37.06	16.17	8.93-35.02	+3.98
Revised I/I+D	57.21	30.06-77.63	63.06	16.13-68.60	-5.85

TABLE E-4 (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
Row 8-9 I/I+D	50.44	45.05-59.13	51.21	43.61-71.43	-.77
Revised Row 8 I/I+D	91.66	82.26-99.99	87.85	81.54-99.99	+3.81
Revised Row 9 I/I+D	79.80	20.00-99.99	76.19	0-99.99	+3.61
Area A	1.54	.44- 2.45	.08	0- 2.84	+1.46
Area B	3.70	.32- 6.51	1.69	.31- 6.78	+2.01
T accepts feeling fol- lowing S talk	0	0	0	0	0
T praises fol- lowing S talk	.44	0- 1.51	0	0- 3.72	+.44
T accepts ideas fol- lowing S talk	15.06	14.82-35.86	20.83	20.59-25.13	-5.77
T questions following S talk	9.66	7.59-13.92	13.32	7.35-28.34	-3.66
T lectures following S talk	25.82	19.35-32.41	28.92	18.72-36.70	-3.10
T directions following S talk	1.61	0- 4.64	.74	.39- 2.08	+.87
T criticism following S talk	.51	0- 1.69	2.88	0- 4.63	-2.37
S response following S talk	25.75	3.45-45.98	13.75	.49-22.46	+12.00

TABLE E-4. (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference
	Median	Range	Median	Range	(E-C)
S initiated following S talk	7.96	3.52-12.41	12.54	2.67-22.44	-4.58
Silence following S talk	4.73	2.76-17.01	4.85	0-19.61	-.12
S initiated/S talk	36.61	17.84-46.21	46.26	5.88-58.33	-9.65
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0- 2.04	0	0	0
Silence following T accepts ideas	2.43	1.80- 3.33	1.57	0- 2.63	+.86
Silence following T questions	8.49	6.19-24.49	15.90	3.96-56.84	-7.41
Silence following T lecture	21.40	18.05-30.67	17.33	14.47-21.41	+4.07
Silence following T directions	4.70	2.00-10.20	5.48	.85- 9.90	-.78
Silence following T criticism	.68	0- 1.35	1.67	0- 3.95	-.99
T accepts ideas/T talk	5.97	2.74-11.79	3.92	1.72-8.25	+2.05

TABLE E-4 (cont'd.)

Variable	Experimental Group		Control Group		Difference
	Median	Range	Median	Range	(E-C)
Silence following S response	3.33	0-10.20	2.40	0- 5.71	+ .93
Silence following S initiated	2.90	1.02- 7.79	5.53	0- 9.52	-2.63
Extended silence/silence	52.30	29.59-58.78	43.97	18.95-64.36	+8.33
Total silence	16.44	8.00-25.06	8.81	4.55-14.59	+7.63
Extended silence	8.76	2.52-14.73	3.79	1.39- 8.89	+4.97

TABLE E-5.

ORIGINAL SCORES OBTAINED BY THE "DIRECT COOPERATING
TEACHER" GROUP AT PHASE TWO

Variable	Experimental Group		Control Group		Dif- ference
	Median	Range	Median	Range	(E-C)
T accepts feelings	0	0	0	0	0
T praise and encouragement	0	0- .42	.05	0- .20	.05
T accept ideas	3.44	2.95- 7.00	1.98	0- 5.14	+1.46
T questions	7.02	4.50-13.59	9.31	5.77-11.89	-2.29
T lectures	57.89	43.18-68.88	61.05	50.10-71.76	-3.16
T directions	3.45	.38- 5.90	1.73	.20- 7.46	+1.72
T criticism	.33	.26- 1.84	1.39	.36- 3.99	-1.06
T talk	84.19	80.35-92.03	84.25	79.58-94.41	-.06
T accepts feelings/ T talk	0	0	0	0	0
T praise/ T talk	0	0- .63	.07	0- .28	-.07
T accepts ideas/ T talk	4.39	4.28-10.44	2.60	0- 7.04	+1.79
T asks questions/ T talk	9.73	5.69-20.25	11.90	7.07-16.81	-2.17
T lectures/ T talk	78.35	64.36-87.17	79.50	71.03-87.83	-1.15
T directions/ T talk	4.59	.48- 8.92	2.29	.26- 8.55	+2.30

TABLE E-5 (cont'd.)

Variable	Experimental Group		Control Group		Difference
	Median	Range	Median	Range	(E-C)
T criticism/ T talk	.50	.49- 8.92	1.86	.43- 5.66	-1.36
Content	64.90	56.77-73.38	70.27	61.95-77.92	-5.37
Extended T accepts feeling	0	0	0	0	0
Extended T praise	0	0	0	0	0
Extended T accepts ideas	.49	0- 1.21	0	0- .07	+.49
Extended T asks questions	.82	.56- 2.32	2.21	.84- 4.61	-1.39
Extended T lectures	48.50	33.02-59.38	51.42	39.82-63.51	-2.92
Extended T directions	2.36	.13- 4.23	.42	0- 5.81	+1.94
Extended T criticism	.06	0- 1.58	.28	0- 1.83	-.22
Total T steady state	62.43	52.03-70.91	64.06	54.14-78.71	-1.63
S response	4.92	3.80- 9.48	7.26	3.87-11.72	-2.34
S initiated	6.43	3.04-11.40	5.03	1.29-12.00	+1.30
S talk	13.68	6.84-16.22	14.04	5.16-18.11	-.36
Extended S response	.59	.27- 1.16	1.73	.72- 4.45	-1.14
Extended S initiated	2.30	1.60- 4.23	.77	.39- 5.38	+1.53
I/I+D	14.09	10.02-31.32	15.60	9.20-21.55	-1.51

TABLE E-5 (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
Revised I/I+D	52.00	31.90-71.94	42.19	0-87.50	+9.81
Row 8-9 I/I+D	67.00	50.43-71.63	37.08	23.84-64.29	+29.92
Revised Row 8 I/I+D	99.99	98.91-99.99	80.22	0-92.00	+19.77
Revised Row 9 I/I+D	99.99	85.71-99.99	37.50	0-99.99	+62.49
Area A	.62	0- 1.81	0	0- .19	+.62
Area B	3.22	2.17- 6.51	.92	0- 8.55	+2.30
T accepts feeling fol- lowing S talk	0	0	0	0	0
T praises following S talk	0	0- 1.95	.15	0- .85	-.15
T accepts ideas fol- lowing S talk	32.14	17.24-35.39	14.32	0-35.04	+17.82
T questions following S talk	12.24	6.48-14.29	11.51	4.38-22.22	+.73
T lectures following S talk	20.90	19.48-28.08	32.65	22.22-46.72	-11.75
T directions following S talk	0	0- .32	1.21	0- 2.78	-1.21
T criticism following S talk	0	0- .49	3.80	1.46- 4.94	-3.80

TABLE E-5 (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference
	Median	Range	Median	Range	(E-C)
S response following S talk	5.05	2.38-10.19	13.53	7.74-27.98	-8.48
S initiated following S talk	22.24	14.29-27.59	8.98	2.88-32.82	+13.26
Silence following S talk	8.23	3.57-16.67	5.13	2.19-13.17	+3.10
S initiated/S talk	49.60	41.56-70.44	31.72	25.00-66.25	+17.88
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0- .32	0	0	0
Silence following T accepts ideas	4.01	2.71-10.00	1.28	0- 8.54	+2.73
Silence following T questions	7.20	3.33- 8.52	14.41	6.67-19.81	-7.21
Silence following T lecture	22.21	20.00-41.70	21.72	13.33-22.22	+.49
Silence following T directions	3.24	.90- 5.88	5.87	1.22- 8.89	-2.63

TABLE E-5: (cont'd.)

Variable	Experimental Group		Control Group		Difference
	Median	Range	Median	Range	(E-C)
Silence following T criticism	.38	- .90	1.79	0- 5.31	-1.41
Silence following S response	2.69	1.79-16.67	3.18	.94- 9.18	-.49
Silence following S initiated	3.97	.45- 7.69	4.36	.94- 8.89	-.39
Extended silence/silence	47.32	40.00-57.10	47.06	41.55-57.78	+.26
Total silence	15.41	7.98-17.62	8.92	6.13-13.56	+6.49
Extended silence	7.60	3.19- 9.53	4.66	2.75- 5.63	+2.94

TABLE E-6

ORIGINAL SCORES OBTAINED BY THE "DIRECT COOPERATING TEACHER"
GROUP AT PHASE THREE

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	0	0- .05	0
T praise and encouragement	.03	0- .14	.08	0- .50	-.05
T accepts ideas	3.35	2.62- 8.31	3.39	.10- 7.78	-.04
T questions	8.76	7.06-12.28	8.53	6.09-14.28	+.23
T lectures	51.18	36.13-62.99	63.08	40.74-76.90	-11.90
T directions	2.70	1.63- 8.58	2.89	.30- 6.84	-.19
T criticism	.43	.16- 4.14	.95	.27- 1.74	-.52
T talk	81.99	75.02-89.36	88.56	73.88-92.06	-6.57
T accepts feelings/ T talk	0	0	0	0- .06	0
T praise/ T talk	.04	0- .24	.11	0- .70	-.07
T accepts ideas/ T talk	4.79	3.36-13.75	4.36	.12- 9.91	+.43
T asks questions/ T talk	12.96	9.06-20.33	10.93	5.75-21.58	+2.03
T lectures/ T talk	73.46	59.81-82.09	76.64	70.66-87.53	-3.18
T directions/ T talk	4.44	2.13-11.00	4.07	.38- 8.99	+.37

TABLE E-6 (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference
	Median	Range	Median	Range	(E-C)
T criticism/ T talk	.66	.26-11.00	1.13	.31- 2.67	.47
Content	59.60	48.41-70.75	74.49	54.71-81.98	-14.89
Extended T accepts feeling	0	0	0	0	0
Extended T praise	0	0	0	0	0
Extended T accepts ideas	.98	.55- 1.32	0	0- 1.51	+.98
Extended T asks questions	1.66	1.03- 2.32	2.09	.81- 4.07	-.43
Extended T lectures	40.26	26.42-55.90	54.14	29.08-72.17	-13.88
Extended T directions	1.07	.47- 6.26	1.16	0- 4.53	-.09
Extended T criticism	.10	0- 3.33	.22	0- .64	-.12
Total T steady state	57.69	48.69-72.13	66.33	45.74-77.55	-8.64
S response	5.53	5.25-20.44	5.84	3.32-13.20	-.31
S initiated	5.20	4.04-14.91	5.06	3.29- 9.67	+.14
S talk	15.05	9.28-26.71	9.97	7.55-22.87	+5.08
Extended S response	1.01	.63- 9.67	.67	.10- 3.59	+.34
Extended S initiated	2.06	1.21- 4.65	1.40	.44- 4.23	+.66
I/I+D	17.78	12.42-34.32	13.89	9.75-28.61	+3.89

TABLE E-6 (cont'd.)

Variable	Experimental Group		Control Group		Difference
	Median	Range	Median	Range	(E-C)
Revised I/I+D	59.41	17.11-70.45	47.26	2.44-88.70	+12.15
Row 8-9 I/I+D	56.79	43.92-68.72	45.35	33.33-66.67	+11.44
Revised Row 8 I/I+D	95.85	92.97-99.99	87.75	50.00-92.90	+8.10
Revised Row 9 I/I+D	87.79	50.00-99.99	42.72	0-99.99	+45.07
Area A	1.38	.89- 1.90	.16	0- 2.17	+1.22
Area B	1.77	.90-12.29	2.35	0- 6.70	-.58
T accepts feeling following S talk	0	0	0	0	0
T praise following S talk	.27	0- .66	0	0- 3.01	0
T accepts ideas following S talk	22.99	9.96-27.72	21.83	1.33-45.48	+1.16
T questions following S talk	13.74	7.51-16.30	6.78	3.67-24.00	+6.96
T lectures following S talk	26.54	13.94-34.78	27.72	20.25-46.67	-1.18
T directions following S talk	.88	0- 1.34	1.07	0- 1.40	-.19
T criticism following S talk	.39	0- 1.09	3.36	1.68- 6.10	-2.97

TABLE E-6: (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	10.67	3.07-36.33	5.21	1.33-19.51	+5.46
S initiated following S talk	15.76	9.79-24.14	16.50	5.49-20.00	-.74
Silence following S talk	5.52	3.75-16.09	5.27	2.67-13.41	+.25
S initiated/ S talk	43.52	23.46-72.41	42.53	32.32-64.22	+.99
Silence following T accepts feeling	0	0	0	0	0
Silence following T accepts ideas	1.36	.45- 5.00	.84	0- 4.55	+.52
Silence following T questions	11.84	6.16-15.70	19.28	10.00-30.00	-7.44
Silence following T lecture	17.32	16.44-30.95	17.20	9.28-21.94	+.12
Silence following T directions	4.73	4.04-11.90	5.50	1.80-11.11	-.77
Silence following T criticism	.99	.45- 3.17	.49	0- 3.09	+.50
Silence following T praise	0	0	0	0	0

TABLE E-6 (cont'd.)

Variable	Experimental Group		Control Group		Difference
	Median	Range	Median	Range	(E-C)
Silence following S response	3.61	1.59- 6.39	3.99	2.00- 6.06	-.38
Silence following S initiated	1.99	1.39-13.90	4.85	2.00-12.61	-2.86
Extended silence/silence	46.83	38.89-66.21	44.39	37.84-52.90	+2.44
Total silence	13.32	12.71-17.51	5.27	3.32-19.27	+8.05
Extended silence	7.07	7.00-10.00	2.20	2.06-10.19	+4.87

TABLE E-7.

ORIGINAL SCORES OBTAINED BY THE "INDIRECT COOPERATING TEACHER"
GROUP AT PHASE ONE

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	.03	0- .43	-.03
T praise and encouragement	1.48	.29- 2.96	.42	.07- 1.63	+.06
T accepts ideas	3.74	3.18- 7.35	6.10	1.88- 9.30	-2.36
T questions	11.82	5.38-16.29	13.67	3.76-22.60	-1.85
T lectures	30.48	23.47-42.19	47.21	36.46-65.38	-16.73
T directions	2.40	.29- 5.37	1.60	.68- 2.52	+.80
T criticism	1.80	1.05- 2.55	.35	0- 1.68	+1.45
T talk	72.24	66.34-78.26	80.19	72.56-86.76	-7.95
T accepts feelings/ T talk	0	0	.05	0- .62	-.05
T praise/ T talk	2.86	.45- 6.57	.63	.09- 2.37	+2.23
T accepts ideas/ T talk	7.03	6.24-13.57	8.63	2.56-13.02	-1.60
T asks questions/ T talk	21.47	11.94-27.30	18.29	5.12-31.62	+3.18
T lectures/ T talk	63.71	43.30-65.82	68.80	51.02-89.15	-5.09
T directions/ T talk	5.10	.45- 9.91	2.15	1.00- 3.94	+2.95

TABLE E-7 (cont'd.)

Variable	Experimental Group		Control Group		Dif- ference
	Median	Range	Median	Range	(E-C)
T criticism/ T talk	3.41	1.63- 5.67	.51	0- 2.36	+2.90
Content	40.12	33.20-58.48	61.14	56.62-69.14	-21.02
Extended T accepts feeling	0	0	0	0- .17	0
Extended T praise	.05	0- .11	0	0	+.05
Extended T accepts ideas	.30	0- 1.23	.63	.18- 1.48	-.33
Extended T asks questions	1.45	1.08- 2.29	1.95	1.07- 7.89	-.50
Extended T lectures	20.30	12.63-30.19	37.34	26.52-56.98	-17.04
Extended T directions	1.29	.10- 3.20	.80	.09- 1.46	+.49
Extended T criticism	.28	.17- .67	0	0- .71	+.28
Total T steady state	43.85	40.25-59.41	53.78	32.85-67.53	-9.93
S response	8.77	4.54-18.95	12.28	4.92-16.68	-3.51
S initiated	8.76	3.90-18.55	4.16	2.52-13.51	+4.60
S talk	20.33	17.25-23.09	18.05	11.41-24.17	+2.28
Extended S response	1.14	.75-10.62	1.82	.76- 4.86	-.68
Extended S initiated	2.52	.67- 6.24	1.22	.43- 5.63	+1.30
I/I+D	29.87	26.27-42.78	27.62	8.05-45.07	+2.25

TABLE E-7. (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Revised I/I+D	57.27	52.66-76.27	69.92	51.06-90.78	-12.65
Row 8-9 I/I+D	67.83	47.23-78.42	63.64	31.03-77.58	+4.19
Revised Row 8 I/I+D	97.16	93.10-99.99	94.94	92.78-99.99	+2.22
Revised Row 9 I/I+D	80.04	0-94.12	85.71	66.67-99.99	-5.67
Area A	1.55	0- 2.96	1.73	.24- 3.05	-.18
Area B	3.71	.45- 7.13	1.36	.12- 2.28	+2.35
T accepts feeling following S talk	0	0	0	0- .61	0
T praises following S talk	4.37	1.07- 4.91	1.13	0- 3.29	+3.24
T accepts ideas following S talk	15.27	11.30-34.43	31.65	11.51-42.82	-16.38
T questions following S talk	15.43	5.88-21.31	10.93	4.27-17.28	+4.50
T lectures following S talk	17.53	11.18-28.75	23.03	12.09-35.98	-5.50
T directions following S talk	.37	0- 1.64	.55	0- 1.00	-.18
T criticism following S talk	1.08	0- 1.60	.91	0- 3.27	+.17

TABLE E-7 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	6.20	3.69-46.47	8.95	4.94-26.25	-2.75
S initiated following S talk	14.83	2.94-28.26	8.50	3.70-23.84	+6.33
Silence following S talk	9.26	7.06-12.83	13.56	3.65-27.44	-4.30
S initiated/S talk	50.03	17.06-80.34	28.94	13.62-66.46	+21.09
Silence following T accepts feeling	0	0	0	0- .50	0
Silence following T praise	.49	0- .84	0	0- .56	+.49
Silence following T accepts ideas	2.24	1.26- 3.65	1.15	.56- 2.83	+1.09
Silence following T questions	7.88	2.09-25.26	21.07	3.73-36.94	-13.19
Silence following T lecture	15.66	10.88-23.16	10.85	9.01-24.50	+4.81
Silence following T directions	2.34	1.05- 4.95	3.24	1.49- 5.41	-.90
Silence following T criticism	2.99	0- 4.60	.40	0- 4.05	+2.59

TABLE E-7 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following S response	1.41	.21- 7.89	10.32	5.67-23.89	-8.91
Silence following S initiated	4.46	2.97- 8.80	5.41	.81-20.15	-.95
Extended silence/silence	59.75	34.74-73.22	39.95	20.35-47.50	+19.80
Total silence	27.50	18.10-32.12	11.43	6.83-13.83	+16.07
Extended silence	16.48	6.29-23.52	4.55	2.14- 6.57	+11.93

TABLE E-8

ORIGINAL SCORES OBTAINED BY THE "INDIRECT COOPERATING
TEACHER" GROUP AT PHASE TWO

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	0	0- .05	0
T praise and encouragement	.08	0- .39	.08	0- .58	0
T accepts ideas	5.70	3.28- 7.17	4.33	2.58- 5.39	+1.37
T questions	12.97	8.16-15.82	12.94	6.57-15.34	+.03
T lectures	34.72	25.98-48.00	51.54	42.58-67.49	-16.82
T directions	1.83	1.01- 2.08	1.43	.19- 3.27	+.40
T criticism	1.21	.48- 1.54	.43	.10- 1.70	+.78
T talk	75.61	63.33-78.69	81.36	68.85-86.54	-5.75
T accepts feelings/ T talk	0	0	0	0- .07	0
T praise/ T talk	.13	0- .76	.11	0- .77	+.02
T accepts ideas/ T talk	10.39	5.24-13.02	6.63	3.29- 8.93	+3.76
T asks questions/ T talk	23.35	13.03-29.33	17.77	8.36-21.73	+5.58
T lectures/ T talk	61.42	50.44-77.65	72.42	65.14-85.92	-11.00
T directions/ T talk	3.36	1.71- 3.54	1.80	.26- 4.43	+1.56

TABLE E-8 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism/ T talk	2.15	.77- 2.91	.54	.13- 2.86	+1.61
Content	48.04	41.08-56.80	66.13	52.63-74.76	-18.09
Extended T accepts feeling	0	0	0	0	0
Extended T praise	0	0	0	0	0
Extended T accepts ideas	.57	.48- .72	.06	0- .95	+.51
Extended T asks questions	2.21	.93- 3.39	3.23	1.80- 5.43	-1.02
Extended T lectures	21.35	20.91-37.20	40.55	29.62-58.45	-19.20
Extended T directions	.90	.37- .93	.57	0- 1.90	+.33
Extended T criticism	.20	0- .46	0	0- .05	+.20
Total T steady state	45.82	39.01-57.28	53.61	42.88-68.05	-7.79
S response	8.97	3.60-12.63	10.28	5.84-13.58	-1.31
S initiated	11.46	9.33-17.19	6.72	4.41-15.32	+4.74
S talk	18.99	15.81-29.82	17.00	12.59-26.83	+1.99
Extended S response	.91	.32- 3.71	2.04	.29- 3.52	-1.13
Extended S initiated	4.52	1.50-11.33	1.93	.52- 4.54	+2.59
I/I+D	33.87	18.26-43.11	25.50	11.72-29.00	+6.37

TABLE E-8 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Revised I/I+D	65.50	62.86-74.19	65.99	58.75-95.38	-.49
Row 8-9 I/I+D	58.67	49.40-66.67	54.12	36.36-62.00	+4.55
Revised Row 8 I/I+D	96.48	94.44-97.83	92.25	80.85-99.99	+4.23
Revised Row 9 I/I+D	88.36	65.00-95.83	68.33	33.33-99.99	+20.03
Area A	.97	.89- 1.39	.24	.10- 1.29	+.73
Area B	1.82	1.17- 2.91	.71	0- 2.79	+1.11
T accepts feeling following S talk	0	0	0	0	0
T praises following S talk	0	0- 1.31	0	0- 2.73	0
T accepts ideas following S talk	22.34	15.57-31.06	24.59	15.58-33.76	-2.25
T questions following S talk	12.00	10.70-15.66	9.38	6.11-13.11	+2.62
T lectures following S talk	24.15	14.41-34.68	30.73	19.29-35.55	-6.58
T directions following S talk	.58	0- 2.70	.79	0- 1.29	-.21
T criticism following S talk	.78	0- 1.77	1.40	.52- 4.30	-.62

TABLE E-8 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	4.73	1.89-12.45	12.52	1.64-18.58	-7.79
S initiated following S talk	25.21	10.36-38.86	12.40	5.15-21.48	+1.21
Silence following S talk	7.67	2.84-10.81	8.20	5.14-18.51	-.53
S initiated/S talk	58.32	45.45-78.77	39.38	28.42-59.38	+18.94
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0	0	0	0
Silence following T accepts ideas	2.77	1.96- 7.18	1.38	0- 2.69	+1.39
Silence following T questions	8.98	7.67-14.63	13.93	5.24-30.86	-4.95
Silence following T lecture	20.83	14.98-26.27	17.67	12.35-38.00	+3.16
Silence following T directions	1.98	.72- 3.48	3.51	2.38- 7.53	-1.53
Silence following T criticism	2.10	.96- 3.14	.90	0- 3.49	+1.20

TABLE E-8 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following S response	1.70	1.39- 3.19	8.77	2.15-17.03	-7.07
Silence following S initiated	4.42	3.14- 4.71	7.98	4.95-18.78	-3.56
Extended silence/silence	53.63	50.00-63.76	38.52	31.44-52.38	+15.11
Total silence	20.18	18.68-29.77	8.80	6.49-13.87	+11.38
Extended silence	11.23	9.98-16.52	3.94	2.08- 4.46	+7.29

TABLE E-9

ORIGINAL SCORES OBTAINED BY THE "INDIRECT COOPERATING
TEACHER GROUP AT PHASE THREE

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	0	0	0
T praise and encouragement	.08	0- .12	.11	0- .49	-.03
T accepts ideas	4.72	2.62-11.97	3.10	2.25- 5.69	+1.62
T questions	9.32	4.83-14.08	7.41	5.90-13.70	+1.91
T lectures	46.47	23.84-61.92	62.42	57.36-72.33	-15.95
T directions	2.35	1.38- 5.84	1.27	.07- 5.65	+1.08
T criticism	.92	.65- 1.31	.46	0- .67	+.46
T talk	78.58	76.43-86.59	82.85	80.82-86.46	-4.27
T accepts feelings/ T talk	0	0	0	0	0
T praise/ T talk	.11	0- .20	.15	0- .61	-.04
T accepts ideas/ T talk	6.83	4.54-20.99	3.84	2.72- 7.34	+2.99
T asks questions/ T talk	13.28	8.37-24.69	9.54	7.08-17.70	+3.74
T lectures/ T talk	76.44	41.80-80.00	81.09	74.11-87.45	-4.65
T directions/ T talk	3.93	1.78-10.23	1.64	.09- 7.11	+2.29

TABLE E-9 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism/ T talk	1.54	.85- 2.29	.58	0- .89	+.96
Content	53.52	37.93-71.29	70.64	68.33-79.24	-17.12
Extended T accepts feeling	0	0	0	0	.0
Extended T praise	0	0	0	0	0
Extended T accepts ideas	.46	.15- .60	.09	.07- 1.34	+.37
Extended T asks questions	1.20	1.02- 1.91	1.91	1.31- 3.72	-.71
Extended T lectures	33.46	15.29-51.24	52.62	46.57-64.52	-19.16
Extended T directions	1.21	.65- 4.43	.39	0- 4.48	+.82
Extended T criticism	.10	0- .30	.05	0- .15	+.05
Total T steady state	53.68	36.12-59.16	67.12	51.38-74.09	-13.44
S response	7.53	3.32-18.71	6.55	4.67-13.27	+.98
S initiated	7.60	4.07-14.49	7.72	5.10-10.58	-.12
S talk	16.56	11.99-25.75	15.94	12.95-18.37	+.62
Extended S response	.93	.52- 5.23	1.51	.75- 3.99	-.58
Extended S initiated	1.74	1.02- 5.82	3.08	.66- 5.50	-1.34
I/I+D	20.23	13.10-45.68	13.68	10.40-25.24	+6.55

TABLE E-9 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Revised I/I+D	64.65	39.17-70.65	61.97	39.42-91.95	+2.68
Row 8-9 I/I+D	56.65	39.47-77.17	50.93	25.20-60.70	+5.72
Revised Row 8 I/I+D	95.83	88.89-97.92	96.49	91.67-99.99	-.66
Revised Row 9 I/I+D	88.36	80.00-99.99	62.50	0-99.99	+25.86
Area A	.81	.19- .93	.21	.09- 1.79	+.60
Area B	2.19	.94- 8.47	.80	0- 5.88	+1.39
T accepts feeling following S talk	0	0	0	0	0
T praises following S talk	.58	0- .65	.48	0- 1.88	+.10
T accepts ideas following S talk	30.48	11.76-44.53	19.30	13.22-30.16	+11.18
T questions following S talk	9.64	7.19-11.52	5.61	4.60-17.86	+4.03
T lectures following S talk	28.13	15.23-31.11	25.92	22.08-50.57	+2.21
T directions following S talk	.68	0- 1.82	.28	0- 1.24	+.40
T criticism following S talk	.69	.56- 1.31	1.27	0- 1.98	-.58

TABLE E-9 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	7.02	2.94-20.31	8.49	8.07-25.63	-1.47
S initiated following S talk	12.29	4.69-33.66	21.82	5.16-38.51	-9.53
Silence following S talk	8.41	3.13-13.73	7.20	5.59- 8.24	+1.21
S initiated/ S talk	43.63	27.34-81.37	56.58	27.78-64.94	-12.95
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0	0	0- 1.85	0
Silence following T accepts ideas	2.34	.71-11.70	1.85	0- 5.17	+.49
Silence following T questions	11.46	3.33-22.22	14.85	9.80-31.03	-3.39
Silence following T lecture	23.71	11.11-30.14	17.39	13.73-29.63	+6.32
Silence following T directions	2.99	2.74- 3.51	4.91	0-11.76	-2.12
Silence following T criticism	3.03	2.07- 3.51	0	0- 1.04	+3.03

TABLE E-9 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following S response	3.20	2.62- 6.85	15.92	6.25-17.65	-12.72
Silence following S initiated	3.02	1.17- 7.38	8.22	1.85-14.89	-5.20
Extended silence/silence	48.91	38.36-55.24	35.48	13.79-48.96	+13.43
Total silence	18.89	10.61-24.45	4.65	3.42- 8.99	+14.24
Extended silence	9.33	4.07-13.50	1.67	.58- 4.40	+7.66

TABLE E-10

ORIGINAL SCORES OBTAINED BY COOPERATING TEACHERS IN
THE EXPERIMENTAL AND THE CONTROL GROUPS

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	0	0- .80	-0
T praise and encouragement	.07	0- .27	.25	.07- 4.29	-.18
T accepts ideas	3.15	1.36- 6.11	4.61	2.35-13.19	-1.46
T questions	9.48	3.53-14.35	10.32	4.75-21.82	-.84
T lectures	55.83	36.72-76.17	61.31	29.04-73.81	-5.48
T directions	1.72	.76- 2.59	2.77	.37- 7.01	-1.05
T criticism	.26	.02- .94	.72	.21- 1.76	-.46
T talk	83.64	72.41-92.50	85.02	70.52-94.39	-1.38
T accepts feelings/ T talk	0	0	0	0- 1.10	0
T praise/ T talk	.09	0- .38	.31	.08- 5.61	-.22
T accepts ideas/ T talk	4.27	1.63-10.06	5.84	2.73-18.13	-1.57
T asks questions/ T talk	12.97	4.23-23.75	13.44	5.48-29.38	-.47
T lectures/ T talk	79.10	60.79-91.40	76.40	50.66-84.73	+2.70
T directions/ T talk	2.31	1.16- 3.77	3.64	.47- 8.60	-1.35

TABLE E-10 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism/ T talk	.38	.03- 1.55	.94	.28- 2.41	-.56
Content	66.10	51.07-79.70	70.04	47.73-82.06	-3.94
Extended T accepts feeling	0	0	0	0- .19	0
Extended T praise	0	0- .02	.01	0- .36	-.01
Extended T accepts ideas	.29	.06- .54	.66	.30- 2.84	-.37
Extended T asks questions	2.09	.75- 4.36	2.42	.34- 8.04	-.33
Extended T lectures	44.16	24.86-69.04	53.79	19.97-69.02	-9.63
Extended T directions	.66	.40- 1.11	1.79	.18- 5.12	-1.13
Extended T criticism	.04	0- .18	.09	0- .57	-.05
Total T steady state	58.50	38.78-78.14	65.91	34.47-77.72	-7.41
S response	6.62	2.30-17.83	7.86	3.47-14.58	-1.24
S initiated	5.82	1.82-14.05	5.07	1.18-13.02	+.75
S talk	14.03	6.75-23.02	13.89	5.15-26.04	+.14
Extended S response	1.41	.28- 6.92	1.08	.13- 4.15	+.33
Extended S initiated	2.27	.52- 5.93	1.29	.27- 3.93	+.98

TABLE E-10 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
I/I+D	17.42	5.86-34.07	19.10	8.61-49.78	-1.68
Revised I/I+D	59.87	37.31-83.05	67.49	30.92-86.69	-7.62
Row 8-9 I/I+D	59.88	29.71-65.30	66.23	33.05-83.46	-6.35
Revised Row 8 I/I+D	97.43	94.00-99.99	92.04	75.89-97.93	+5.39
Revised Row 9 I/I+D	88.89	57.14-99.99	79.67	16.67-99.99	+9.22
Area A	.41	.07- .97	1.00	.37- 7.42	-.59
Area B	1.04	.64- 1.39	2.42	.25- 6.17	-1.38
T accepts feeling following S talk	0	0	0	0- .85	0
T praises following S talk	.31	0- 1.48	1.02	.25-19.29	-.71
T accepts ideas following S talk	20.93	11.07-28.67	31.09	13.27-48.89	-10.17
T questions following S talk	11.06	5.43-18.67	10.64	5.65-17.50	+.42
T lectures following S talk	24.19	17.84-52.78	19.46	9.22-40.12	+4.73
T directions following S talk	.52	.10- 1.40	.59	.08- 2.22	-.07
T criticism following S talk	.20	0- 1.63	2.44	.26- 6.78	-2.24

TABLE E-10 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	10.08	4.14-32.27	9.16	1.54-22.33	+.92
S initiated following S talk	16.86	5.78-28.86	13.82	1.75-28.21	+3.04
Silence following S talk	6.85	3.07-13.08	6.27	1.28-18.10	+.58
S initiated/ S talk	45.51	16.82-67.82	33.68	12.75-66.40	+11.83
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0- .16	.08	0- 2.21	-.08
Silence following T accepts ideas	1.62	.82- 4.73	2.70	.67- 5.50	-1.08
Silence following T questions	11.30	3.43-25.55	17.66	6.58-35.73	-6.36
Silence following T lecture	26.35	20.10-38.85	11.49	7.21-18.59	+14.86
Silence following T directions	3.17	1.00- 8.78	4.76	1.01-19.73	-1.59
Silence following T criticism	.51	.10- 2.58	.62	0- 3.30	-.11

TABLE E-10 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following S response	2.42	1.14- 8.70	6.98	.75-18.52	-4.56
Silence following S initiated	2.77	.72-14.38	3.79	.70-23.40	-.98
Extended silence/silence	48.27	32.35-55.43	44.98	28.28-56.84	+3.29
Total silence	14.95	9.89-20.28	7.05	3.72-11.67	+7.90
Extended silence	7.13	3.89-10.78	3.43	1.15- 6.13	+3.70

TABLE E-11

ORIGINAL SCORES OBTAINED BY COOPERATING TEACHERS IN THE
"DIRECT COOPERATING TEACHER" GROUP

Variable	Experimental Group		Control Group		Dif- ference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	0	0- .04	0
T praise and encouragement	.03	0- .15	.22	.07- .57	-.19
T accepts ideas	1.96	1.36- 3.19	3.23	2.35- 4.57	-1.27
T questions	7.18	3.53- 9.54	7.90	4.75-11.36	-.72
T lectures	60.50	52.84-76.17	68.16	58.14-73.81	-7.66
T directions	1.92	1.42- 2.59	4.48	1.15- 7.01	-2.56
T criticism	.32	.17- .39	.93	.37- 1.38	-.61
T talk	84.92	82.43-92.50	90.61	87.31-94.39	-5.69
T accepts feelings/ T talk	0	0	0	0- .05	0
T praise/ T talk	.04	0- .21	.25	.08- .72	-.21
T accepts ideas/T talk	2.73	1.63- 4.65	3.85	2.73- 5.40	-1.12
T asks questions/ T talk	10.06	4.23-13.91	9.44	5.48-13.56	+.62
T lectures/ T talk	84.46	77.02-91.40	81.55	71.26-84.73	+2.91
T directions/ T talk	2.43	2.04- 3.77	5.30	1.31- 8.60	-2.87

TABLE E-11 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism/ T talk	.45	.20- .57	1.12	.43- 1.73	-.67
Content	67.69	62.38-79.70	76.54	69.19-81.71	-8.85
Extended T accepts feeling	0	0	0	0- .02	0
Extended T praise	0	0	0	0- .36	0
Extended T accepts ideas	.13	.06- .28	.38	.30- 1.06	-.25
Extended T asks questions	.88	.75- 2.27	2.42	.56- 4.03	-1.54
Extended T lectures	49.73	43.00-69.04	62.17	51.34-69.02	-12.44
Extended T directions	.82	.57- 1.11	3.24	.86- 5.12	-1.42
Extended T criticism	.04	.02- .18	.16	.02- .57	-.12
Total T steady state	64.81	58.07-78.14	74.04	68.52-80.69	-9.23
S response	5.15	2.30- 8.07	5.45	3.47- 7.71	-.30
S initiated	6.05	4.45- 9.59	2.64	1.45- 6.28	+3.41
S talk	12.60	6.75-14.84	8.85	5.15-11.59	+3.75
Extended S response	1.15	.28- 2.48	.56	.13- 1.96	+.59
Extended S initiated	2.88	1.38- 3.41	1.13	.66- 3.21	+1.75

TABLE E-11 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
I/I+D	12.90	5.86-18.64	13.74	8.61-19.16	-.84
Revised I/I+D	50.93	37.31-53.96	38.01	30.92-60.06	+12.92
Row 8-9 I/I+D	47.51	36.90-59.74	62.35	38.87-74.73	-17.84
Revised Row 8 I/I+D	97.35	96.05-99.99	89.49	75.89-94.83	+7.86
Revised Row 9 I/I+D	88.89	76.47-99.99	77.92	16.67-99.99	+10.97
Area A	.18	.07- .41	.58	.37- 1.63	-.40
Area B	1.22	1.11- 1.38	4.28	1.71- 6.74	-3.06
T accepts feeling following S talk	0	0	0	0	0
T praises following S talk	.20	0- 1.01	1.05	.58- 1.98	-.85
T accepts ideas following S talk	17.36	11.07-21.31	31.56	21.31-43.21	-13.20
T questions following S talk	10.03	8.94-12.29	9.83	5.95-12.45	+.20
T lectures following S talk	29.99	19.71-43.85	19.82	16.02-40.12	+10.17
T directions following S talk	.44	.28- 1.07	.96	.23- 2.22	-.52
T criticism following S talk	.07	0- .19	3.10	1.56- 6.78	-3.03

TABLE E-11 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	8.82	4.19-18.77	6.85	1.54-19.68	+1.97
S initiated following S talk	22.59	17.48-28.86	14.22	9.52-28.21	+8.37
Silence following S talk	7.91	3.07-13.08	3.90	3.13-11.71	+4.01
S initiated/S talk	61.28	39.01-65.92	30.85	22.54-60.08	+30.43
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0	0	0- 1.80	0
Silence following T accepts ideas	.96	.92- 1.76	1.69	.74- 5.50	-.73
Silence following T questions	10.43	3.43-11.43	13.62	6.62-35.78	-3.19
Silence following T lecture	26.56	20.10-29.71	11.93	7.21-16.51	+14.63
Silence following T directions	5.26	1.56- 8.78	6.85	2.29-10.07	-1.59

TABLE E-11 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following T criticism	.74	.59- .95	.89	.35- 1.83	-.15
Silence following S response	2.40	1.14- 2.89	4.61	.75-12.87	-2.21
Silence following S initiated	3.90	.95- 9.63	2.12	.70- 7.26	+.78
Extended silence/silence	51.70	46.81-55.43	55.10	28.90-70.83	-3.30
Total silence	14.98	9.90-18.17	7.22	3.99- 8.66	+7.76
Extended silence	7.13	5.49-10.00	4.06	1.15- 6.13	+3.07

TABLE E-12

ORIGINAL SCORES OBTAINED BY COOPERATING TEACHERS IN THE
"INDIRECT COOPERATING TEACHER" GROUP

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T accepts feelings	0	0	0	0- .21	0
T praise and encouragement	.17	.10- .27	.17	.11- 4.29	0
T accepts ideas	5.43	4.20- 6.11	5.39	4.22-10.42	+.04
T questions	12.44	10.92-14.35	14.23	7.95-21.82	-1.79
T lectures	45.40	36.72-53.69	53.33	38.68-68.92	-7.93
T directions	1.42	.76- 2.17	.94	.37- 6.03	+.48
T criticism	.23	.02- .94	.44	.21- 1.09	-.21
T talk	75.24	72.41-81.92	82.91	70.52-92.05	-7.67
T accepts feelings/ T talk	0	0	0	0- .28	0
T praise/ T talk	.29	.15- .38	.24	.13- 5.61	+.05
T accepts ideas/ T talk	8.53	5.85-10.06	6.98	5.41-13.65	+1.55
T asks questions/ T talk	18.52	16.73-23.75	17.57	10.01-29.38	+.95
T lectures/ T talk	70.79	60.79-74.66	73.29	50.66-83.13	-2.50
T directions/ T talk	2.16	1.16- 3.59	1.35	.47- 7.90	+.81

TABLE E-12 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
T criticism/ T talk	.36	.03- 1.55	.57	.28- 1.23	-.21
Content	56.98	51.07-66.32	68.10	55.19-82.06	-11.12
Extended T accepts feeling	0	0	0	0- .05	0
Extended T praise	0	0	.02	0- .05	0
Extended T accepts ideas	.46	.38- .54	.90	.49- 2.75	-.44
Extended T asks questions	2.40	2.10- 3.19	4.66	1.55- 8.04	-2.26
Extended T lectures	33.67	24.68-42.74	44.86	29.89-63.86	-11.19
Extended T directions	.51	.40- .65	.44	.17- 4.71	+.07
Extended T criticism	.05	0- .11	.01	0- .18	+.04
Total T steady state	52.56	38.78-54.90	58.07	45.82-74.24	-5.51
S response	10.43	6.67-17.83	11.94	6.48-14.58	-1.51
S initiated	9.02	3.61-14.05	2.88	1.18-12.55	+6.14
S talk	21.08	15.88-23.02	16.04	7.65-26.04	+5.04
Extended S response	1.75	.84- 6.92	2.14	.29- 4.15	-.39
Extended S initiated	2.70	1.46- 5.93	.54	.27- 3.93	+2.16

TABLE E-12 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
I/I+D	26.78	23.78-34.07	24.78	15.96-41.16	+2.09
Revised I/I+D	78.09	66.76-83.05	74.57	70.50-86.69	+3.52
Row 8-9 I/I+D	61.27	51.63-65.30	73.08	50.76-83.46	-11.81
Revised Row 8 I/I+D	99.23	94.00-99.99	94.21	86.34-97.93	+5.02
Revised Row 9 I/I+D	83.21	61.11-91.49	83.72	50.00-99.99	-.51
Area A	.80	.53- .97	1.17	.66- 7.42	-.37
Area B	.85	.64- 1.28	.62	.25- 6.17	+.23
T accepts feeling fol- lowing S talk	0	0	0	0- .32	0
T praises following S talk	.34	.29- 1.48	.68	.28-19.29	-.34
T accepts ideas fol- lowing S talk	23.45	20.52-25.68	36.27	13.43-48.89	-12.82
T questions following S talk	13.91	8.41-16.82	12.75	9.17-17.50	+1.16
T lectures following S talk	24.19	17.84-29.56	18.44	12.38-23.19	+11.81
T directions following S talk	.40	.10- 1.40	.51	.11- .69	-.11
T criticism following S talk	.26	0- 1.63	1.87	.64- 4.36	-1.61

TABLE E-12 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
S response following S talk	9.56	4.14-32.27	12.90	2.64-22.33	-3.34
S initiated following S talk	14.64	6.93-28.71	5.57	1.75-15.86	+9.07
Silence following S talk	6.82	5.20-11.86	7.91	1.93-16.29	-1.09
S initiated/S talk	45.51	16.82-67.82	21.48	12.75-48.18	+24.03
Silence following T accepts feeling	0	0	0	0	0
Silence following T praise	0	0- .16	.11	0- 2.21	-.11
Silence following T accepts ideas	3.76	2.80- 4.73	2.92	.67- 4.41	+.84
Silence following T questions	13.92	9.47-25.55	23.06	6.58-28.47	-9.14
Silence following T lecture	20.74	20.34-28.95	10.86	8.51-18.18	+9.88
Silence following T directions	2.38	1.00- 4.68	3.35	1.01-11.03	-.97

TABLE E-12 (cont'd.)

Variable	Experimental Group		Control Group		Difference (E-C)
	Median	Range	Median	Range	
Silence following T criticism	.37	.15- 2.58	.31	0- 3.30	+.06
Silence following S response	3.19	1.57- 8.70	12.24	2.94-18.52	-9.05
Silence following S initiated	4.54	2.33-14.38	4.21	1.47-20.89	+.33
Extended silence/silence	45.07	32.35-52.33	41.24	28.28-46.83	+3.83
Total silence	14.85	12.21-16.57	6.39	3.72-11.67	+8.46
Extended silence	6.80	3.95- 8.21	2.82	1.41- 5.03	+3.98

APPENDIX F

THE COMPUTED FRIEDMAN CHI-SQUARE AND MINIMUM MANN-WHITNEY
U VALUES FOR THOSE SCORES FOR WHICH THE APPROPRIATE NULL
HYPOTHESES COULD NOT BE REJECTED AT THE 0.05 LEVEL

TABLE F-1

NON-SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL
INTERACTION FROM PHASE ONE TO PHASE TWO

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	.889	Extended T praise	.750	.056
T accepts ideas	.333	2.000	Extended T asks questions	1.333	.222
T questions	3.000	2.000	Extended T lectures	3.000	2.000
T lectures	3.000	2.000	Extended T directions	3.000	2.000
T directions	3.000	.889	Extended T criticism	.333	.056
T criticism	.083	.889	Total T steady state	0	2.000
T talk	1.333	2.000	S talk	3.000	3.556
T accepts feelings/T talk	0	.889	Extended S initiated	3.000	.056
T accepts ideas/T talk	1.333	2.000	I/I+D	3.000	2.000
T asks questions/T talk	3.000	2.000	Revised I/I+D	.333	.889
T lectures/T talk	3.000	2.000	Row 8-9 I/I+D	0	3.556
T directions/T talk	3.000	.222	Revised Row 8 I/I+D	1.333	1.389
T criticism/T talk	.750	.889	Revised Row 9 I/I+D	1.333	.500
Extended T accepts feeling	0	.056	Area B	3.000	.222

TABLE F-1 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feeling following S talk	0	.056	Silence following T directions	1.333	0
T accepts ideas following S talk	3.000	3.556	Silence following T criticism	0	0
T questions following S talk	.333	2.000	Silence following S response	.333	.222
T lectures following S talk	3.000	.889	Silence following S initiated	.333	.222
T directions following S talk	.083	.500	Extended silence/silence	3.000	2.000
T criticism following S talk	.333	.889	Total silence	1.333	.889
Silence following S talk	0	.889	Extended silence	1.333	.222
Silence following T accepts feeling	0	.056			
Silence following T accepts ideas	0	.500			
Silence following T questions	0	.889			

¹Experimental group.²Control group.

TABLE F-2

NON-SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL
INTERACTION FROM PHASE TWO TO PHASE THREE $\alpha=0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	.056	T criticism/ T talk	.083	2.000
T praise and encourage- ment	.333	.500	Extended T accepts feeling	0	0
T accepts ideas	0	.889	Extended T praise	0	.056
T questions	.083	.222	Extended T accepts ideas	1.333	.500
T directions	0	0	Extended T asks questions	.333	3.556
T criticism	.083	2.000	Extended T directions	0	.222
T talk	1.333	.889	Extended T criticism	.333	.056
T accepts feelings/ T talk	0	.056	Total T steady state	3.000	.889
T praise/ T talk	.333	.500	S initiated	0	0
T accepts ideas/ T talk	0	2.000	S talk	.333	.889
T asks questions/ T talk	1.333	.222	Extended S initiated	0	2.000
T lectures/ T talk	.333	.889	I/I+D	2.083	0
T directions/ T talk	0	0	Revised I/I+D	0	.889
			Row 8-9 I/I+D	0	2.000

TABLE F-2 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Revised Row 9 I/I+D	2.083	0	S initiated following S talk	1.333	.222
Area A	.333	.500	Silence following S talk	1.333	.222
Area B	0	0	S initiated/ S talk	0	2.000
T accepts feeling fol- lowing S talk	0	.056	Silence fol- lowing T ac- cepts feeling	0	0
T praises following S talk	0	0	Silence fol- lowing T praise	.333	.222
T accepts ideas fol- lowing S talk	3.000	3.556	Silence fol- lowing T ac- cepts ideas	1.333	0
T questions following S talk	.333	.889	Silence fol- lowing T lecture	1.333	.222
T lectures following S talk	1.333	.889	Silence fol- lowing T directions	1.333	2.000
T directions following S talk	1.333	2.000	Silence fol- lowing T criticism	3.000	1.389
T criticism following S talk	0	.889	Silence fol- lowing S initiated	.333	.889
S response following S talk	3.000	3.556			

¹Experimental group.²Control group.

TABLE F-3

NON-SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL
INTERACTION FROM PHASE ONE TO PHASE THREE

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feeling following S talk	0	0	T accepts ideas	.750	3.556
T accepts ideas fol- lowing S talk	1.333	.889	T questions	1.333	.889
T questions following S talk	0	3.556	T lectures	3.000	2.000
T lectures following S talk	3.000	.889	T directions	.333	0
T criticism following S talk	.083	.056	T criticism	.083	.056
S response following S talk	3.000	0	T talk	1.333	0
Silence following S talk	1.333	.222	T accepts feelings/ T talk	0	.500
S initiated	1.333	2.000	T accepts ideas/ T talk	1.333	2.000
S talk	.333	0	T asks questions/ T talk	1.333	.889
Extended S response	3.000	.222	T lectures/ T talk	3.000	3.556
T accepts feelings	0	.500	T criticism/ T talk	.083	.056
			Extended T accepts feeling	0	.056
			Extended T praise	.750	.056
			Extended T ac- cepts ideas	.333	3.556

TABLE F-3 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	G ²		E ¹	G ²
Extended T asks questions	1.333	0	Silence following T questions	.333	2.000
Extended T lectures	3.000	2.000	Silence following T lecture	1.333	2.000
Extended T directions	.333	.889	Silence following T directions	0	.222
Extended T criticism	.083	.056	Silence following T criticism	2.083	.889
Total T steady state	0	2.000	Silence following S response	0	3.556
I/I+D	3.000	2.000	Silence following S initiated	1.333	.222
Revised I/I+D	0	0	Extended silence/silence	1.333	.222
Revised Row 8 I/I+D	2.083	0	Extended silence	3.000	2.000
Revised Row 9 I/I+D	1.333	0			
Area B	0	.222			
Silence following T accepts feeling	0	.056			
Silence following T accepts ideas	1.333	.500			

¹Experimental group.²Control group.

TABLE F-4

NON-SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL
INTERACTION IN THE "DIRECT COOPERATING TEACHER" GROUP $\alpha = 0.05$

Variable	Computed Chi-square			Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	.250	T criticism/ T talk	2.000	1.333
T praise and encouragement	2.375	.083	Content	3.500	.333
T accepts ideas	.500	1.333	Extended T accepts feeling	0	0
T questions	3.500	.333	Extended T praise	0	0
T lectures	3.500	.333	Extended T accepts ideas	.500	.583
T directions	0	1.333	Extended T asks questions	2.000	.333
T criticism	2.000	1.333	Extended T lectures	3.500	0
T talk	1.500	0	Extended T directions	.500	2.250
T accepts feelings/ T talk	0	.250	Extended T criticism	2.375	.333
T praise/ T talk	2.375	.083	Total T steady state	1.500	0
T accepts ideas/ T talk	.500	1.333	S response	3.500	.333
T asks questions/ T talk	3.500	.333	S initiated	1.500	1.000
T lectures/ T talk	2.000	0	S talk	1.500	0
T directions/ T talk	0	1.000	Extended S response	4.875	1.333

TABLE F-4 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Extended S initiated	6.000	1.750	T criticism following S talk	.500	1.000
I/I+D	3.500	.333	S response following S talk	4.500	1.000
Revised I/I+D	.500	2.333	Silence following S talk	1.500	.333
Revised Row 8 I/I+D	2.375	2.333	S initiated/ S talk	4.500	1.333
Revised Row 9 I/I+D	3.500	.583	Silence following T accepts feeling	0	0
Area A	4.500	2.083	Silence following T praise	.500	0
Area B	.500	.250	Silence following T accepts ideas	2.000	.333
T accepts feeling following S talk	0	0	Silence following T questions	3.500	1.333
T praises following S talk	.875	.333	Silence following T lecture	4.500	4.333
T accepts ideas following S talk	3.500	4.333	Silence following T directions	1.500	.333
T lectures following S talk	.500	1.333			
T directions following S talk	3.375	1.000			

TABLE F-4 (cont'd.)

Variable	Computed Chi-square	
	¹ E	² C
Silence following T criticism	2.625	.333
Silence following S initiated	1.500	.333
Extended silence/ silence	.500	1.333
Total silence	.500	1.000
Extended silence	.500	1.000

¹Experimental group.

²Control group.

TABLE F-5

NON-SIGNIFICANT CHANGES IN SELECTED ASPECTS OF VERBAL
INTERACTION IN THE "INDIRECT COOPERATING TEACHER" GROUP $\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	¹ E	² C		¹ E	² C
T accepts feelings	0	1.750	Extended T accepts feeling	0	.250
T praise and encouragement	6.000	4.083	Extended T praise	1.500	0
T accepts ideas	1.625	3.000	Extended T asks questions	2.000	2.333
T questions	3.500	2.333	Extended T lectures	.500	4.333
T lectures	.500	4.333	Extended T directions	2.000	2.583
T directions	1.500	1.333	Total T steady state	.500	6.333
T talk	3.500	1.333	S response	3.500	3.000
T accepts feelings/ T talk	0	1.750	S initiated	2.000	4.000
T praise/ T talk	6.000	4.083	S talk	1.500	1.333
T accepts ideas/T talk	1.500	3.000	Extended S response	2.000	.333
T asks questions/ T talk	3.500	4.333	Extended S initiated	2.000	2.333
T lectures/ T talk	2.000	4.333	I/I+D	2.000	4.333
T directions/ T talk	2.000	.333	Revised I/I+D	.500	.333
T criticism/ T talk	4.500	3.083	Row 8-9 I/I+D	1.500	3.000
			Revised Row 8 I/I+D	1.125	2.250

TABLE F-5 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Revised Row 9 I/I+D	.500	3.000	S initiated/ S talk	.500	1.333
Area B	2.000	2.583	Silence fol- lowing T accepts feeling	0	.250
T accepts feeling fol- lowing S talk	0	.250	Silence fol- lowing T praise	3.375	.250
T accepts ideas following S talk	1.500	1.333	Silence fol- lowing T accepts ideas	.500	.333
T questions following S talk	.500	.333	Silence fol- lowing T questions	.500	1.333
T lectures following S talk	2.000	1.333	Silence fol- lowing T lecture	6.000	6.333
T directions following S talk	1.625	1.000	Silence fol- lowing T directions	4.500	.333
T criticism following S talk	.500	2.250	Silence fol- lowing T criticism	3.500	3.250
S response following S talk	1.500	.333	Silence fol- lowing S response	2.000	2.333
S initiated following S talk	2.000	4.333	Silence fol- lowing S initiated	2.000	.333
Silence following S talk	3.500	1.333	Extended silence/silence	.500	.333

¹Experimental group.²Control group.

TABLE F-6

NON-SIGNIFICANT CHANGES IN PROXIMITY³ SCORES FROM
PHASE ONE TO PHASE TWO

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	2.000	T directions/ T talk	1.333	0
T praise and encouragement	2.083	.889	T criticism/ T talk	.750	0
T accepts ideas	.333	.222	Extended T accepts feeling	0	.056
T questions	1.333	2.000	Extended T praise	.750	.056
T lectures	1.333	0	Extended T asks questions	1.333	3.556
T directions	1.333	.222	Extended T lectures	1.333	0
T criticism	.083	.222	Extended T directions	3.000	.222
T talk	0	.222	Extended T criticism	.083	.056
T accepts feelings/ T talk	0	2.000	Total T steady state	0	0
T praise/ T talk	2.083	.889	S response	.333	.222
T accepts ideas/ T talk	.333	.889	S initiated	3.000	2.000
T asks questions/ T talk	.333	2.000	S talk	1.333	.222
T lectures/ T talk	1.333	.222	Extended S response	2.083	.222
			I/I+D	1.333	.222

TABLE F-6 (cont'd.)

Variable	Computed Chi-square			Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Revised I/I+D	.333	.222	T criticism following S talk	0	2.000
Row 8-9 I/I+D	.333	2.000	S response following S talk	0	0
Revised Row 8 I/I+D	1.333	1.389	S initiated following S talk	.333	.889
Revised Row 9 I/I+D	0	.500	Silence following S talk	0	.889
Area B	1.333	0	S initiated/ S talk	.333	.889
T accepts feeling following S talk	0	.056	Silence following T accepts feeling	0	.056
T praises following S talk	.750	1.389	Silence following T accepts ideas	.333	.056
T accepts ideas following S talk	0	3.556	Silence following T questions	1.333	3.556
T questions following S talk	.333	.889	Silence following T lecture	1.333	3.556
T lectures following S talk	3.000	3.556	Silence following T directions	.333	2.000
T directions following S talk	2.083	1.389	Silence following T criticism	0	0

TABLE F-6 (cont'd.)

Variable	Computed Chi-square	
	E ¹	C ²
Silence following S response	1.333	.222
Silence following S initiated	1.333	.222
Extended silence/ silence	1.333	.889
Total silence	1.333	0
Extended silence	1.333	.889

¹Experimental group.

²Control group.

³Absolute difference between a student teacher's score and the corresponding score of his cooperating teacher.

TABLE F-7

NON-SIGNIFICANT CHANGES IN PROXIMITY³ SCORES FROM
PHASE TWO TO PHASE THREE

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	.056	T criticism/ T talk	.083	.222
T praise and encouragement	1.333	.500	Content	3.000	2.000
T accepts ideas	.333	0	Extended T accepts feeling	0	0
T questions	.083	.889	Extended T praise	0	.056
T lectures	3.000	0	Extended T accepts ideas	.333	.056
T directions	.333	.222	Extended T asks questions	3.000	.0
T criticism	.083	2.000	Extended T lectures	3.000	.222
T talk	1.333	.222	Extended T directions	0	0
T accepts feelings/ T talk	0	.056	Extended T criticism	.750	.056
T praise/ T talk	1.333	.056	Total T steady state	1.333	.889
T accepts ideas/ T talk	.333	.222	S response	.333	.222
T asks questions/ T talk	1.333	.222	S initiated	0	.222
T lectures/ T talk	1.333	.0	S talk	.333	.222
T directions/ T talk	0	.222	Extended S response	1.333	0
			Revised I/I+D	1.333	.889

TABLE F-7 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Row 8-9 I/I+D	1.333	.056	S response following S talk	.333	.889
Revised Row 8 I/I+D	.750	0	S initiated following S talk	.333	0
Revised Row 9 I/I+D	1.333	2.000	Silence following S talk	3.000	.222
Area A	0	.056	S initiated/ S talk	1.333	.889
Area B	.333	.222	Silence fol- lowing T accepts feeling	0	0
T accepts feeling following S talk	0	.056	Silence following T praise	.333	.222
T praises following S talk	1.333	.0	Silence following T accepts ideas	0	.222
T accepts ideas following S talk	1.333	.222	Silence following T questions	.333	.889
T questions following S talk	0	2.000	Silence following T lecture	.333	.889
T lectures following S talk	.333	0	Silence following T directions	.333	.889
T directions following S talk	.333	.222	Silence following T criticism	.333	.056
T criticism following S talk	.333	.222			

TABLE F-7 (cont'd.)

Variable	Computed Chi-square	
	E ¹	C ²
Silence following S response	1.333	.222
Silence following S initiated	.333	.889
Extended silence/ silence	1.333	.222
Total silence	1.333	0
Extended silence	1.333	.889

¹ Experimental group.

² Control group.

³ Absolute difference between a student teacher's score and the corresponding score of his cooperating teacher.

TABLE F-8.

NON-SIGNIFICANT CHANGES IN PROXIMITY³ SCORES FROM
PHASE ONE TO PHASE THREE

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	1 E	2 C		1 E	2 C
T accepts feelings	0	1.389	T criticism/ T talk	.083	.056
T praise and encouragement	3.000	.222	Extended T accepts feeling	0	.056
T accepts ideas	.083	.222	Extended T praise	.750	.056
T questions	1.333	3.556	Extended T accepts ideas	1.333	2.000
T lectures	1.333	2.000	Extended T asks questions	0	.222
T directions	1.333	3.556	Extended T lectures	1.333	2.000
T criticism	.083	.056	Extended T directions	1.333	.889
T talk	.333	.222	Extended T criticism	.083	.056
T accepts feelings/ T talk	0	1.389	Total T steady state	.333	2.000
T praises/ T talk	3.000	.222	S response	3.000	0
T accepts ideas/ T talk	0	.222	S talk	3.000	.222
T asks questions/ T talk	.333	.889	Extended S response	1.333	.222
T lectures/ T talk	1.333	.222	Extended S initiated	0	3.556
T directions/ T talk	1.333	3.556	I/I+D	1.333	.222

TABLE F-8 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Revised I/I+D	.333	0	S response following S talk	1.333	.222
Row 8-9 I/I+D	.333	3.556	S initiated following S talk	1.333	3.556
Revised Row 8 I/I+D	.750	3.556	Silence following S talk	.333	.889
Revised Row 9 I/I+D	1.333	.222	S initiated/ S talk	0	3.556
Area A	3.000	2.000	Silence following T accepts feeling	0	.056
Area B	.333	.889	Silence following T accepts ideas	.333	.056
T accepts feeling following S talk	0	.222	Silence following T questions	.333	3.556
T praises following S talk	3.000	.222	Silence following T lecture	0	.889
T accepts ideas following S talk	1.333	2.000	Silence following T directions	0	3.556
T lectures following S talk	0	2.000	Silence following T criticism	.083	.889
T directions following S talk	.333	.056			
T criticism following S talk	.750	.056			

TABLE F-8 (cont'd.)

Variable	Computed Chi-square	
	E ¹	C ²
Silence following S response	2.083	.222
Silence following S initiated	.333	.222
Extended silence/silence	.333	.222
Total silence	3.000	.222

¹Experimental group.

²Control group.

³Absolute difference between a student teacher's score and the corresponding score of his cooperating teacher.

TABLE F-9

NON-SIGNIFICANT CHANGES IN PROXIMITY³ SCORES IN THE "DIRECT COOPERATING TEACHER" GROUP

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	.250	Extended T accepts feeling	0	0
T praise and encouragement	.125	1.083	Extended T praise	0	0
T accepts ideas	.500	.333	Extended T accepts ideas	.500	.083
T questions	.500	.333	Extended T asks questions	1.500	.333
T lectures	3.500	.333	Extended T lectures	3.500	1.000
T directions	.500	5.333	Extended T directions	1.500	3.583
Content	9.500	3.000	Extended T criticism	1.125	.333
T talk	0	.333	Total T steady state	1.500	.333
T accepts feelings/T talk	0	.250	S response	1.500	.333
T praise/T talk	.125	2.250	S initiated	2.000	.333
T accepts ideas/T talk	.500	.333	S talk	.500	.333
T asks questions/T talk	1.500	0	Extended S response	2.375	1.000
T lectures/T talk	2.000	.333	Extended S initiated	3.500	3.083
T directions/T talk	.500	5.333	I/I+D	2.000	.333
Row 8-9 I/I+D	6.000	5.333	Revised I/I+D	0	.333

TABLE F-9 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
Revised Row 8 I/I+D	2.375	2.333	S initiated fol- lowing S talk	3.500	2.333
Revised Row 9 I/I+D	.500	.083	Silence fol- lowing S talk	1.500	2.333
Area A	4.500	.583	Silence fol- lowing T accepts feeling	0	0
Area B	1.500	1.583	Silence fol- lowing T praise	.500	0
T accepts feeling fol- lowing S talk	0	0	Silence following T accepts ideas	2.000	0
T praises fol- lowing S talk	.125	1.333	Silence fol- lowing T lecture	3.500	4.333
T accepts ideas fol- lowing S talk	4.500	3.000	Silence fol- lowing T directions	.500	2.333
T questions following S talk	3.500	1.000	Silence fol- lowing T criticism	2.375	1.333
T lectures following S talk	.500	4.000	Silence fol- lowing S response	2.625	.333
T directions following S talk	.125	1.000	Silence following S initiated	.500	1.333
T criticism following S talk	.500	2.333	Extended silence/ silence	1.500	2.333
S response fol- lowing S talk	2.000	.333	Total silence	2.000	2.333
			Extended silence	2.000	3.000

¹Experimental group.²Control group.³Absolute difference between each student teacher's score and the corresponding score of his cooperating teacher.

TABLE F-10

NON-SIGNIFICANT CHANGES IN PROXIMITY³ SCORES IN THE
"INDIRECT COOPERATING TEACHER" GROUP

$\alpha = 0.05$

Variable	Computed Chi-square		Variable	Computed Chi-square	
	E ¹	C ²		E ¹	C ²
T accepts feelings	0	3.250	Extended T accepts ideas	6.000	4.333
T praise and encouragement	3.500	1.750	Extended T asks questions	1.500	5.333
T accepts ideas	.375	1.000	Extended T lectures	1.500	.333
T questions	.500	4.333	Extended T directions	3.500	5.583
T lectures	1.500	.333	Total T steady state	1.500	1.000
T talk	3.500	1.000	S response	3.500	.333
T accepts feelings/ T talk	0	3.250	S initiated	.500	4.333
T praise/ T talk	3.500	1.750	S talk	2.000	.333
T accepts ideas/T talk	1.500	2.333	Extended S response	3.500	.333
T asks ques- tions/T talk	.500	3.000	Extended S initiated	.500	4.333
T lectures/ T talk	0	1.000	I/I+D	.500	1.000
Content	4.500	0	Revised I/I+D	.500	1.333
Extended T accepts feeling	0	.250	Row 8-9 I/I+D	.500	1.000
Extended T praise	1.500	.0	Revised Row 8 I/I+D	1.125	.750
			Revised Row 9 I/I+D	4.500	1.333
			Area A	2.000	1.333

TABLE F-10 (cont'd.)

Variable	Computed Chi-square		Variable	Computed Chi-square	
	1 E	2 C		1 E	2 C
Area B	1.500	5.583	Silence fol- lowing T		
T accepts feeling fol- lowing S talk	0	.250	accepts feeling	0	.250
T praises fol- lowing S talk	3.500	.250	Silence fol- lowing T praise	3.375	.250
T accepts ideas fol- lowing S talk	3.500	1.000	Silence fol- lowing T accepts ideas	2.000	1.333
T questions following S talk	.500	4.333	Silence fol- lowing T lecture	2.000	4.000
T lectures following S talk	2.000	1.000	Silence fol- lowing T directions	.500	4.333
T directions following S talk	1.625	3.000	Silence fol- lowing T criticism	2.000	.583
T criticism following S talk	3.500	.583	Silence fol- lowing S response	2.000	1.000
S response fol- lowing S talk	6.000	1.000	Silence fol- lowing S initiated	1.500	.333
S initiated following S talk	1.500	1.333	Extended silence/silence	.500	0
Silence following S talk	.500	1.000	Total silence	3.500	2.333
S initiated/ S talk	2.000	2.333	Extended silence	3.500	3.000

¹Experimental group.²Control group.³Absolute difference between each student teacher's score and the corresponding score of his cooperating teacher.

TABLE F-11.

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL GROUPS AT PHASE ONE
 $\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	78.00	Extended T directions	90.50
T praise and encouragement	69.00	Extended T criticism	84.00
T accepts ideas	101.00	Total T steady state	82.00
T questions	100.50	S response	86.00
T directions	89.00	S initiated	99.00
T criticism	93.50	S talk	86.50
T accepts feelings/ T talk	78.00	Extended S response	68.00
T praise/T talk	62.50	Extended S initiated	94.00
T accepts ideas/ T talk	79.00	I/I+D	89.00
T asks questions/ T talk	93.00	Revised I/I+D	104.00
T lectures/T talk	80.00	Row 8-9 I/I+D	89.00
T directions/T talk	73.00	Revised Row 8 I/I+D	81.00
T criticism/T talk	88.00	Revised Row 9 I/I+D	88.00
Extended T accepts feeling	102.00	Area A	63.50
Extended T praise	81.00	Area B	78.00
Extended T accepts ideas	62.00	T accepts feeling following S talk	102.00
Extended T asks questions	88.00		

TABLE F-11 (cont'd.)

Variable	Min U	Variable	Min U
T accepts ideas following S talk	83.00	S initiated/ S talk	90.00
T questions following S talk	99.00	Silence following T accepts feeling	102.00
T lectures following S talk	67.00	Silence following T praise	64.50
T directions following S talk	100.50	Silence following T questions	72.00
T criticism following S talk	70.00	Silence following T lecture	79.00
S response following S talk	66.00	Silence following T directions	97.50
S initiated following S talk	77.00	Silence following T criticism	107.00
Silence following S talk	99.00	Silence following S initiated	65.00

¹Differences identified by the Mann-Whitney U test.

TABLE F-12

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL "DIRECT COOPERATING
TEACHER" GROUPS AT PHASE ONE

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	12.00	Extended T accepts feeling	12.00
T praise and encouragement	9.00	Extended T praise	12.00
T accepts ideas	8.00	Extended T accepts ideas	4.00
T questions	11.00	Extended T asks questions	5.00
T lectures	6.00	Extended T lectures	5.00
T directions	10.00	Extended T directions	11.00
T criticism	8.00	Extended T criticism	12.00
T talk	8.00	Total T steady state	8.00
T accepts feelings/ T talk	12.00	S response	10.00
T praise/T talk	8.00	S initiated	12.00
T accepts ideas/ T talk	7.00	S talk	9.00
T asks questions/ T talk	9.00	Extended S response	5.00
T lectures/ T talk	9.00	Extended S initiated	10.00
T directions/ T talk	6.00	I/I+D	9.00
T criticism/ T talk	10.50	Revised I/I+D	11.00
Content	5.00	Row 8-9 I/I+D	12.00

TABLE F-12 (cont'd.)

Variable	Min U	Variable	Min U
Revised Row 8 I/I+D	11.00	Silence following T accepts feeling	12.00
Revised Row 9 I/I+D	12.00	Silence following T praise	9.00
Area A	4.00	Silence following T questions	10.00
Area B	10.00	Silence following T lecture	4.00
T accepts feeling following S talk	12.00	Silence following T directions	12.00
T praises fol- lowing S talk	9.00	Silence following T criticism	6.50
T accepts ideas following S talk	6.00	Silence following S response	11.50
T questions fol- lowing S talk	9.00	Silence following S initiated	9.00
T lectures fol- lowing S talk	9.00	Extended silence/ silence	11.00
T directions fol- lowing S talk	11.00	Total silence	6.00
T criticism fol- lowing S talk	4.00	Extended silence	7.00
S response fol- lowing S talk	5.00		
S initiated fol- lowing S talk	6.00		
Silence following S talk	12.00		
S initiated/S talk	8.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-13

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING
TEACHER" GROUPS AT PHASE ONE

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	6.00	Extended T criticism	6.00
T praise and encouragement	6.00	Total T steady state	7.00
T accepts ideas	8.00	S response	10.00
T questions	9.00	S initiated	8.00
T directions	8.00	S talk	9.00
T accepts feelings/ T talk	6.00	Extended S response	10.00
T praise/T talk	4.00	Extended S initiated	6.00
T accepts ideas/ T talk	9.00	I/I+D	11.00
T asks questions/ T talk	11.00	Revised I/I+D	6.00
T lectures/T talk	9.00	Row 8-9 I/I+D	10.00
T directions/T talk	7.00	Revised Row 8 I/I+D	7.50
Extended T accepts feeling	10.00	Revised Row 9 I/I+D	10.00
Extended T praise	6.00	Area A	10.00
Extended T accepts ideas	8.00	Area B	5.00
Extended T asks questions	9.00	T accepts feeling following S talk	10.00
Extended T directions	8.00	T accepts ideas following S talk	8.00

TABLE F-13 (cont'd.)

Variable	Min U	Variable	Min U
T questions following S talk	6.00	Silence following T praise	4.50
T lectures following S talk	8.00	Silence following T accepts ideas	6.00
T directions following S talk	12.00	Silence following T questions	5.00
T criticism following S talk	12.00	Silence following T lecture	6.00
S response following S talk	9.00	Silence following T directions	8.00
S initiated following S talk	9.00	Silence following T criticism	6.50
Silence following S talk	9.00	Silence following S initiated	12.00
S initiated/S talk	9.00	Extended silence/silence	5.00
Silence following T accepts feeling	10.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-14

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL GROUPS AT PHASE TWO

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	102.00	Extended T criticism	93.00
T praise and encouragement	103.00	Total T steady state	76.50
T questions	91.00	Silence following S talk	81.00
T lectures	62.00	Silence following T accepts feeling	108.00
T directions	101.00	Silence following T praise	90.00
T criticism	98.00	Silence following T questions	66.00
T talk	83.00	Silence following T lecture	63.00
T accepts feelings/ T talk	102.00	Silence following T criticism	108.00
T praise/T talk	102.00	Silence following S initiated	87.00
T asks questions/ T talk	104.00	Extended silence/ silence	62.00
T lectures/ T talk	85.00	S response	68.00
T directions/ T talk	84.00	S initiated	80.00
T criticism/T talk	106.50	S talk	104.00
Extended T accepts feeling	108.00	Extended S initiated	86.00
Extended T praise	102.00		
Extended T directions	82.00		

TABLE F-14 (cont'd.)

Variable	Min U	Variable	Min U
I/I+D:	84.00	T accepts ideas following S talk	65.00
Revised I/I+D	79.00	T questions following S talk	76.00
Area B	68.00	T directions following S talk	71.00
T accepts feeling following S talk	108.00	S initiated following S talk	70.00
T praises following S talk	86.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-15

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL "DIRECT COOPERATING
TEACHER" GROUPS AT PHASE TWO

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	12.00	Extended T asks questions	5.00
T praise and encouragement	10.50	Extended T lectures	8.00
T accepts ideas	6.00	Extended T directions	8.00
T questions	9.00	Extended T criticism	11.00
T lectures	8.00	Total T steady state	11.00
T directions	8.00	S response	6.00
T criticism	5.00	S initiated	10.00
T talk	12.00	S talk	10.00
T accepts feelings/ T talk	12.00	Extended S initiated	5.00
T praise/T talk	10.50	I/I+D	10.00
T accepts ideas/ T talk	6.00	Area A	4.50
T questions/T talk	10.00	Area B	7.00
T lectures/T talk	11.00	T accepts feeling following S talk	12.00
T directions/ T talk	7.00	T praises following S talk	9.00
T criticism/T talk	7.00	T accepts ideas following S talk	5.00
Content	6.00	T questions following S talk	11.00
Extended T accepts feeling	12.00	Revised I/I+D	10.00
Extended T praise	12.00		

TABLE F-15 (cont'd.)

Variable	Min U	Variable	Min U
S initiated following S talk	5.00	Silence following T directions	5.00
Silence following S talk	8.00	Silence following S response	11.00
S initiated/S talk	6.00	Silence following S initiated	11.00
Silence following T accepts feeling	12.00	Extended silence/silence	11.00
Silence following T praise	9.00	Total silence	4.00
Silence following T lecture	7.00	Extended silence	5.00

¹Differences identified by the Mann-Whitney U test.

TABLE F-16

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING
TEACHER" GROUPS AT PHASE TWO

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	10.00	Extended T directions	9.50
T praise and encouragement	10.00	Total T steady state	5.50
T accepts ideas	7.00	S response	10.00
T questions	10.00	S talk	8.00
T directions	10.00	Extended S response	11.00
T criticism	7.00	Extended S initiated	7.00
T accepts feelings/ T talk	10.00	I/I+D	6.00
T praise/T talk	10.00	Revised I/I+D	11.00
T accepts ideas/ T talk	5.00	Row 8-9 I/I+D	8.00
T asks questions/ T talk	7.00	Revised Row 8 I/I+D	9.00
T lectures/T talk	6.00	Revised Row 9 I/I+D	7.00
T directions/T talk	6.00	Area B	4.00
T criticism/T talk	5.00	T accepts feeling following S talk	12.00
Extended T accepts feeling	12.00	T praise following S talk	12.00
Extended T praise	12.00	T praise following S talk	11.50
Extended T accepts ideas	4.00	T accepts ideas following S talk	10.00
Extended T asks questions	6.00		

TABLE F-16 (cont'd.)

Variable	Min U	Variable	Min U
T questions following S talk	5.00	S initiated/S talk	4.00
T lectures following S talk	7.00	Silence following T accepts feeling	12.00
T directions following S talk	10.50	Silence following T praise	12.00
T criticism following S talk	9.00	Silence following T questions	9.00
S response following S talk	8.00	Silence following T lecture	9.00
S initiated following S talk	7.00	Silence following T criticism	7.00
S following S talk	9.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-17

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL GROUPS AT PHASE THREE

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	96.00	S response	105.50
T praise and encouragement	85.50	S initiated	94.50
T accepts ideas	70.00	S talk	82.00
T questions	93.00	Extended S response	96.00
T directions	102.00	Extended S initiated	104.00
T criticism	100.00	I/I+D	64.00
T talk	65.00	Revised I/I+D	92.00
T accepts feelings/ T talk	96.00	Row 8-9 I/I+D	73.00
T praise/T talk	91.00	Revised Row 8 I/I+D	71.00
T asks questions/ T talk	74.50	Area B	87.00
T lectures/T talk	64.00	T accepts feeling following S talk	102.00
T directions/ T talk	86.00	T praises fol- lowing S talk	90.00
T criticism/ T talk	95.00	T accepts ideas following S talk	93.00
Extended T accepts feeling	108.00	T lectures fol- lowing S talk	97.00
Extended T praise	102.00	T directions fol- lowing S talk	84.50
Extended T directions	98.50	S response fol- lowing S talk	93.00
Extended T criticism	95.50		

TABLE F-17 (cont'd.)

Variable	Min U	Variable	Min U
S initiated following S talk	89.00	Silence following T accepts ideas	64.00
Silence following S talk	71.00	Silence following T questions	83.00
S initiated/S talk	104.00	Silence following T lecture	69.00
Silence following T accepts feeling	108.00	Silence following T directions	70.00
Silence following T praise	96.00	Silence following S initiated	69.00

¹Differences identified by the Mann-Whitney U test.

TABLE F-18

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL "DIRECT COOPERATING
TEACHER" GROUPS AT PHASE THREE

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	10.00	Extended T praise	12.00
T praise and encouragement	8.50	Extended T accepts ideas	4.00
T accepts ideas	9.00	Extended T asks questions	10.00
T questions	12.00	Extended T lectures	6.00
T lectures	7.00	Extended T directions	11.00
T directions	10.00	Extended T criticism	10.50
T criticism	8.00	Total T steady state	8.00
T talk	7.00	S response	9.00
T accepts feelings/ T talk	10.00	S initiated	9.50
T praise/T talk	8.00	S talk	9.00
T accepts ideas/ T talk	9.00	Extended S response	7.00
T asks questions/ T talk	10.00	Extended S initiated	7.00
T lectures/ T talk	9.00	I/I+D	8.00
T directions/T talk	10.00	Revised I/I+D	11.00
T criticism/T talk	10.00	Row 8-9 I/I+D	6.00
Content	6.00	Revised Row 9 I/I+D	5.50
Extended T accepts feeling	12.00	Area A	4.00

TABLE F-18 (cont'd.)

Variable	Min U	Variable	Min U
Area B	9.00	Silence following T accepts ideas	8.00
T accepts feeling following S talk	12.00	Silence following T questions	4.00
T praises fol- lowing S talk	12.00	Silence following T lecture	9.00
T accepts ideas following S talk	11.00	Silence following T directions	11.00
T questions fol- lowing S talk	6.00	Silence following T criticism	8.00
T lectures fol- lowing S talk	9.00	Silence following S response	12.00
T directions fol- lowing S talk	10.50	Silence following S initiated	7.00
S response fol- lowing S talk	9.00	Extended silence/ silence	9.00
S initiated fol- lowing S talk	11.00	Total silence	4.00
Silence following S talk	10.00	Extended silence	5.00
S initiated/S talk	10.00		
Silence following T accepts feeling	12.00		
Silence following T praise	12.00		

¹Differences identified by the Mann-Whitney U test.

.. TABLE F-19

NON-SIGNIFICANT DIFFERENCES¹ IN VERBAL INTERACTION BETWEEN
THE CONTROL AND EXPERIMENTAL "INDIRECT COOPERATING
TEACHER" GROUPS AT PHASE THREE

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	12.00	Extended T directions	7.00
T praise and encouragement	8.50	Extended T criticism	8.00
T accepts ideas	7.00	S response	10.00
T questions	10.00	S initiated	11.00
T directions	6.00	S talk	11.00
T talk	6.00	Extended S response	8.00
T accepts feelings/ T talk	12.00	Extended T initiated	10.00
T praise/T talk	10.00	I/I+D	6.00
T accepts ideas/ T talk	4.00	Revised I/I+D	10.00
T asks questions/ T talk	7.50	Row 8-9 I/I+D	8.00
T lectures/T talk	6.00	Revised Row 8 I/I+D	8.50
T directions/ T talk	6.00	Area A	6.00
Content	4.00	Area B	6.00
Extended T accepts feeling	12.00	T accepts feeling following S talk	12.00
Extended T praise	12.00	T praises following S talk	10.00
Extended T accepts ideas	5.00	T accepts ideas following S talk	7.00
Extended T asks questions	4.00	T questions following S talk	6.00

TABLE F-19 (cont'd.)

Variable	Min U	Variable	Min U
T lectures following S talk	11.00	Silence following T praise	10.00
T directions following S talk	8.50	Silence following T accepts ideas	9.00
T criticism following S talk	10.00	Silence following T questions	9.00
S response following S talk	9.00	Silence following T lecture	8.00
S initiated following S talk	8.00	Silence following T directions	8.00
Silence following S talk	6.00	Silence following S initiated	5.00
S initiated/S talk	10.00	Extended silence/silence	5.00
Silence following T accepts feeling	12.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-20

NON-SIGNIFICANT DIFFERENCES¹ IN CHANGES IN VERBAL INTERACTION
FROM PHASE ONE TO PHASE THREE BETWEEN THE CONTROL
AND EXPERIMENTAL GROUPS

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	90.00	Extended T asks questions	96.00
T accepts ideas	71.00	Extended T lectures	92.00
T questions	106.00	Extended T directions	105.00
T lectures	107.00	Extended T criticism	100.50
T directions	95.00	Total T steady state	73.00
T criticism	91.50	S response	76.00
T talk	99.00	S initiated	91.50
T accepts feelings/ T talk	90.00	S talk	102.00
T accepts ideas/ T talk	82.00	Extended S initiated	95.00
T asks questions/ T talk	102.00	I/I+D	107.00
T lectures/T talk	104.00	Revised I/I+D	85.00
T directions/T talk	90.00	Row 8-9 I/I+D	94.00
T criticism/T talk	89.50	Revised Row 8 I/I+D	90.00
Content	103.00	Revised Row 9 I/I+D	82.00
Extended T accepts feeling	102.00	Area A	99.50
Extended T praise	76.50	Area B	101.50
Extended T accepts ideas	73.00	T accepts feeling following S talk	108.00

TABLE F-20 (cont'd.)

Variable	Min U	Variable	Min U
T accepts ideas following S talk	77.00	Silence following T questions	71.00
T questions following S talk	71.00	Silence following T lecture	89.00
T lectures following S talk	85.00	Silence following T directions	87.00
T directions following S talk	85.50	Silence following T criticism	68.00
T criticism following S talk	96.50	Silence following S response	88.00
S initiated following S talk	100.00	Silence following S initiated	97.00
Silence following S talk	88.00	Extended silence/silence	79.00
S initiated/S talk	85.00	Total silence	97.00
Silence following T accepts feeling	102.00	Extended silence	68.00
Silence following T accepts ideas	95.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-21

NON-SIGNIFICANT DIFFERENCES¹ IN CHANGES IN VERBAL INTER-
ACTION FROM PHASE ONE TO PHASE THREE BETWEEN THE CONTROL
AND EXPERIMENTAL "DIRECT COOPERATING TEACHER" GROUPS
 $\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	10.00	Extended T praise	12.00
T praise and encouragement	6.00	Extended T accepts ideas	11.00
T accepts ideas	12.00	Extended T asks questions	10.00
T questions	10.00	Extended T lectures	11.00
T lectures	10.00	Extended T directions	8.00
T directions	12.00	Extended T criticism	10.00
T criticism	11.00	Total T steady state	12.00
T talk	11.00	S response	9.00
T accepts feelings/T talk	10.00	S initiated	9.00
T praise/T talk	6.00	S talk	11.00
T accepts ideas/T talk	11.00	Extended S response	5.00
T asks questions/T talk	12.00	Extended S initiated	4.00
T lectures/T talk	10.00	I/I+D	10.00
T directions/T talk	10.00	Revised I/I+D	12.00
T criticism/T talk	11.00	Row 8-9 I/I+D	7.00
Content	11.00	Revised Row 8 I/I+D	8.00
Extended T accepts feeling	12.00	Revised Row 9 I/I+D	11.00

TABLE F-21 (cont'd.)

Variable	Min U	Variable	Min U
Area A	8.00	Silence following T praise	9.00
Area B	11.00	Silence following T accepts ideas	10.00
T accepts feeling following S talk	12.00	Silence following T questions	12.00
T praises following S talk	9.00	Silence following T lecture	12.00
T accepts ideas following S talk	10.00	Silence following T directions	12.00
T lectures following S talk	12.00	Silence following T criticism	8.00
T directions following S talk	10.00	Silence following S response	6.00
T criticism following S talk	8.00	Silence following S initiated	12.00
S response following S talk	10.00	Extended silence/silence	12.00
S initiated following S talk	7.00	Total silence	12.00
Silence following S talk	8.00	Extended silence	11.00
S initiated/S talk	8.00		
Silence following T accepts feeling	12.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-22

NON-SIGNIFICANT DIFFERENCES¹ IN CHANCES IN VERBAL INTER-
ACTION FROM PHASE ONE TO PHASE THREE BETWEEN THE CONTROL
AND EXPERIMENTAL "INDIRECT COOPERATING TEACHER" GROUPS
 $\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	6.00	Extended T lectures	9.00
T praise and encouragement	5.00	Extended T directions	11.00
T accepts ideas	6.00	Extended T criticism	5.00
T questions	11.00	Total T steady state	5.00
T lectures	12.00	S response	8.00
T directions	9.00	S initiated	6.00
T talk	7.00	S talk	11.00
T accepts feelings/ T talk	6.00	Extended S response	7.00
T accepts ideas/ T talk	5.00	Extended S initiated	6.00
T asks questions/ T talk	11.00	I/I+D	10.00
T lectures/T talk	12.00	Revised I/I+D	8.00
T directions/T talk	8.00	Row 8-9 I/I+D	8.00
Content	12.00	Revised Row 8 I/I+D	5.50
Extended T accepts feeling	10.00	Area A	11.00
Extended T praise	6.00	Area B	11.00
Extended T accepts ideas	5.00	T accepts feeling following S talk	10.00
Extended T asks questions	11.00	T accepts ideas following S talk	4.00

TABLE F-22 (cont'd.)

Variable	Min U	Variable	Min U
T questions following S talk	9.00	Silence following T questions	9.00
T lectures following S talk	12.00	Silence following T lecture	10.00
T directions following S talk	8.00	Silence following T directions	10.00
T criticism following S talk	12.00	Silence following T criticism	9.00
S response following S talk	9.00	Silence following S response	9.00
S initiated following S talk	9.00	Silence following S initiated	10.00
Silence following S talk	8.00	Extended silence/silence	9.00
S initiated/S talk	8.00	Total silence	8.00
Silence following T accepts feeling	10.00	Extended silence	7.00
Silence following T praise	4.00		
Silence following T accepts ideas	12.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-23

NON-SIGNIFICANT DIFFERENCES¹ IN CHANGES IN PROXIMITY FROM
PHASE ONE TO PHASE THREE BETWEEN THE CONTROL AND
EXPERIMENTAL GROUPS

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	78.00	Extended T praise	76.50
T praise and encouragement	74.50	Extended T accepts ideas	64.00
T accepts ideas	106.00	Extended T asks questions	92.00
T questions	102.00	Extended T lectures	71.00
T lectures	77.00	Extended T directions	86.00
T directions	72.00	Extended T criticism	104.50
T criticism	98.50	Total T steady state	97.00
T talk	104.00	S response	66.00
T accepts feelings/ T talk	78.00	S initiated	91.00
T praise/T talk	73.00	S talk	77.00
T accepts ideas/ T talk	102.00	Extended S response	65.00
T asks questions/ T talk	106.00	Extended S initiated	87.00
T lectures/T talk	102.00	I/I+D	100.00
T directions/T talk	71.00	Revised I/I+D	102.00
T criticism/T talk	92.50	Revised Row 8 I/I+D	88.00
Extended T accepts feeling	102.00	Revised Row 9 I/I+D	89.00
		Area A	67.00
		Area B	82.00

TABLE F-23 (cont'd.)

Variable	Min U	Variable	Min U
T accepts feeling following S talk	96.00	S initiated/S talk	73.00
T praises following S talk	64.00	Silence following T accepts feeling	102.00
T accepts ideas following S talk	64.00	Silence following T accepts ideas	101.50
T questions following S talk	102.00	Silence following T questions	66.00
T lectures following S talk	74.00	Silence following T lecture	81.00
T directions following S talk	77.50	Silence following T directions	68.00
T criticism following S talk	98.50	Silence following T criticism	89.00
S response following S talk	66.00	Silence following S response	103.50
S initiated following S talk	70.00	Silence following S initiated	106.00
Silence following S talk	86.00	Extended silence/silence	101.00

¹Differences identified by the Mann-Whitney U test.

TABLE F-24

NON-SIGNIFICANT DIFFERENCES¹ IN CHANGES IN PROXIMITY FROM
 PHASE ONE TO PHASE THREE BETWEEN THE CONTROL AND
 EXPERIMENTAL "DIRECT COOPERATING TEACHER" GROUPS
 $\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	10.00	Extended T praise	12.00
T praise and encouragement	11.00	Extended T accepts ideas	11.00
T accepts ideas	9.00	Extended T asks questions	11.00
T questions	11.00	Extended T lectures	8.00
T lectures	8.00	Extended T directions	10.00
T directions	8.00	Extended T criticism	8.00
T criticism	5.00	Total T steady state	12.00
T talk	9.00	S response	8.00
T accepts feelings/ T talk	10.00	S initiated	12.00
T praise/T talk	11.00	S talk	8.00
T accepts ideas/ T talk	9.00	Extended S response	7.00
T asks questions/ T talk	12.00	Extended S initiated	8.00
T lectures/T talk	10.00	I/I+D	10.00
T directions/T talk	8.00	Revised I/I+D	12.00
T criticism/T talk	9.00	Row 8-9 I/I+D	4.00
Content	9.00	Revised Row 8 I/I+D	10.00
Extended T accepts feeling	12.00	Revised Row 9 I/I+D	11.00

TABLE F-24 (cont'd.)

Variable	Min U	Variable	Min U
Area A	9.00	Silence following T accepts feeling	12.00
Area B	12.00	Silence following T praise	9.00
T accepts feeling following S talk	12.00	Silence following T accepts ideas	8.00
T praises following S talk	11.00	Silence following T lecture	6.00
T accepts ideas fol- lowing S talk	8.00	Silence following T directions	12.00
T questions fol- lowing S talk	12.00	Silence following T criticism	4.00
T lectures fol- lowing S talk	11.00	Silence following S response	7.00
T directions fol- lowing S talk	7.00	Silence following S initiated	7.00
T criticism fol- lowing S talk	8.00	Extended silence/ silence	8.00
S response fol- lowing S talk	6.00	Total silence	6.00
Silence following S talk	8.00	Extended silence	9.00
S initiated/ S talk	4.00		

¹Differences identified by the Mann-Whitney U test.

TABLE F-25

NON-SIGNIFICANT DIFFERENCES¹ IN CHANGES IN PROXIMITY FROM
PHASE ONE TO PHASE THREE BETWEEN THE CONTROL AND EXPERI-
MENTAL "INDIRECT COOPERATING TEACHER" GROUPS

$\alpha = 0.05$

Variable	Min U	Variable	Min U
T accepts feelings	6.00	Extended T lectures	7.00
T prainse and encouragement	7.00	Extended T directions	8.00
T accepts ideas	11.00	Extended T criticism	4.00
T questions	11.00	Total T steady state	9.00
T lectures	8.00	S response	11.00
T directions	8.00	S initiated	6.00
T talk	10.00	S talk	4.00
T accepts feelings/ T talk	6.00	Extended S response	10.00
T praise/T talk	6.00	I/I+D	11.00
T accepts ideas/ T talk	11.00	Revised I/I+D	8.00
T asks questions/ T talk	9.00	Row 8-9 I/I+D	7.00
T lectures/T talk	11.00	Revised Row 8 I/I+D	4.50
T directions/T talk	10.00	Revised Row 9 I/I+D	4.00
Content	5.00	Area A	6.00
Extended T accepts feeling	10.00	Area B	7.00
Extended T praise	6.00	T accepts feeling following S talk	10.00
Extended T asks questions	6.00	T praises following S talk	5.00
		T accepts ideas following S talk	10.00

TABLE F-25 (cont'd.)

Variable	Min U	Variable	Min U
T questions following S talk	10.00	Silence following T praise	5.00
T lectures following S talk	8.00	Silence following T accepts ideas	6.00
T directions following S talk	8.00	Silence following T lecture	5.00
T criticism following S talk	11.00	Silence following T directions	4.00
S response following S talk	7.00	Silence following T criticism	11.00
S initiated following S talk	8.00	Silence following S response	6.00
Silence following S talk	8.00	Silence following S initiated	11.00
S initiated/S talk	10.00	Extended silence/silence	7.00
Silence following T accepts feeling	10.00		

¹Differences identified by the Mann-Whitney U test.

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SUMMARY REPORT

BR Project No. 6-8078
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**CHANGES IN THE VERBAL INTERACTION PATTERNS OF SECONDARY
SCIENCE STUDENT TEACHERS WHO HAVE HAD TRAINING IN INTER-
ACTION ANALYSIS AND THE RELATIONSHIP OF THESE CHANGES TO
THE VERBAL INTERACTION OF THEIR COOPERATING TEACHERS**

May 1967

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OFFICE OF EDUCATION**

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THE VERBAL INTERACTION OF
THEIR COOPERATING TEACHERS

Project No. 6-8078
Contract No. OEC-1-7-068078-2074

Richard J. McLeod

May 1967

The research reported herein was performed pursuant to a CONTRACT with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

Cornell University

Ithaca, New York

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INTRODUCTION

The effect of public school cooperating teachers on their student teachers is generally considered to be large. It would seem profitable for educational research to study these effects and investigate ways of making them more beneficial. Until recently, however, there have been relatively few studies involving the cooperating teacher. Part of the problem has been the lack of research tools that would enable one to study teaching objectively.

The development of techniques of interaction analysis has provided researchers with valuable observational tools with which to study teaching in at least some of its dimensions. The Flanders System of Interaction Analysis, in particular, has shown considerable promise in its ability to describe the verbal interaction taking place in the classroom in terms of the dimension of directness of teacher influence.

Recent studies also indicate that training in interaction analysis might be beneficial to in-service and pre-service teachers. It would seem that a knowledge of this technique would give a student teacher a greater awareness of his cooperating teacher's verbal patterns and help him to be more selective in the teaching patterns he adopts. In addition, this knowledge would make him more conscious of his own teaching behavior. Although interaction analysis

can not tell the teacher how best to teach, it can provide a "mirror" that will help the student teacher to modify his own teaching to conform more closely to his intentions.

It was the purpose of this study to use interaction analysis to obtain systematic objective observations of student teachers and their cooperating teachers to determine if, in fact, student teachers really do adopt the teaching patterns of their cooperating teachers, and whether training in interaction analysis makes any difference in the way student teachers change during the student teaching experience.

Objectives

The objectives of this study were:

1. to identify non-random changes which occur in the verbal patterns of student teachers who are trained in the Flanders System of Interaction Analysis.
2. to search within these verbal patterns for changes that are related to the verbal patterns of their cooperating teachers.
3. to compare the verbal patterns of the experimental group with those of a control group who were not trained in the Flanders technique.
4. to provide implications for further research.

Method

During the school years 1964-1965 and 1965-1966, two groups of Cornell University student teachers of secondary science and their cooperating teachers were

observed, using the Flanders System of Interaction Analysis. Both groups had similar educational background, with the exception that the 1965-1966 group of twelve student teachers (hereafter referred to as the experimental group) were given additional training in the Flanders System of Interaction Analysis. The 1964-1965 group of eighteen student teachers did not receive this training and will be referred to as the control group (Matthews, 1966).

Because of the small number of student teachers available, it was considered desirable to use the entire population in preference to a random sampling technique. Thus, with the exception of two student teachers assigned to schools at a distance of more than eighty miles from Cornell, the entire body of science student teachers in 1964-1965 became the control group and the entire body of science student teachers in 1965-1966 became the experimental group. An application of the Kolmogorov-Smirnov One-Sample Test to 23 pre-selected characteristics of science student teachers at Cornell University failed to reject, at the .05 level, the null hypothesis that the samples could have been drawn from the population of science student teachers at Cornell from 1963 to 1966.

Six observations of 30 to 60 minutes each were obtained for each student teacher and for each cooperating teacher. These observations were coded using the Flanders

System of Interaction Analysis. To provide information relating to change in verbal patterns, the six observations of the student teachers were divided into three groups consisting of: (a) phase one--two observations near the beginning of student teaching, (b) phase two--two observations near the middle of student teaching, and (c) phase three--two observations near the end of the student teaching experience. Each observation of a particular student teacher was obtained as he taught the same class of pupils in the same subject.

After the student teachers had completed their student teaching experience and had returned to the university campus, the cooperating teachers were observed for six periods of 30 to 60 minutes each, teaching the same group of pupils as had been taught by their respective student teachers.

After the first phase of observations had been completed, the experimental group of student teachers met for a series of five weekly seminars of two hours each, in which they received instruction in the Flanders System of Interaction Analysis. The training emphasized analysis of the Flanders matrix, discussions of various teaching patterns, and practice (using "role playing") at varying one's teaching patterns. No emphasis was placed on high observer reliability. The training

stressed flexibility of teaching patterns to suit the objectives of the teacher. No value judgments were made by the instructor concerning "good" or "bad" patterns of teaching. The individual student teacher was the sole judge of the appropriate teaching pattern for a given learning situation.

After they had completed their student teaching assignments, the student teachers evaluated the training they had received in interaction analysis. The value they placed on this training can be summarized as low. On a scale ranging from "no evidence" (0) to "outstanding" (10), a median value of 3 was given to their opinion of the potential value this training might have to them as teachers. The only item ranked lower than 3 was the value placed on their own experimentation with the system in teaching their classes (rank of 2).

At each phase of observation and for each individual teacher, a Flanders matrix was plotted and 59 different scores computed (McLeod, 1966), representing various aspects of teacher-pupil verbal interaction.

The 59 scores for the control and experimental groups were subjected to the Friedman Two-Way Analysis of Variance by Ranks test to identify non-random changes: (a) during the first half of student teaching (phase one to phase two), (b) during the second half of student

teaching (phase two to phase three), and (c) during the entire period of student teaching (phase one to phase three).

Relationships between the changes in verbal patterns of the student teachers and the verbal patterns of their cooperating teachers were also sought. A proximity score was defined as the absolute difference between a student teacher's score on a particular variable and the corresponding score of his cooperating teacher. These proximity scores were then analyzed by means of the Friedman test for non-random changes during the first half, the second half, and the entire period of student teaching.

A two-tailed Mann-Whitney U test was used to compare the scores of the experimental and control groups at phase one, phase two, and phase three.

Based on their revised I/I+D scores, the one-third most direct and the one-third most indirect cooperating teachers were identified in each group. These cooperating teachers and their student teachers were respectively defined as the "direct cooperating teacher" (DCT) group and the "indirect cooperating teacher" (ICT) group. The analysis described above was then performed on the scores of each of these two "extreme" groups.

Friedman significance tables for two phases (e.g., phase one to phase two) were not available for groups as

small as the direct and indirect cooperating teacher groups. Because of this, it was only possible to search for changes across the entire period of student teaching. This problem did not exist when using the Mann-Whitney U test for comparisons between the groups.

The small sample sizes used in the direct and indirect cooperating teacher groups render the findings tentative at best. The analysis was performed primarily to indicate directions for further research.

Results

THE ENTIRE SAMPLE

A comparison of teaching patterns between the control and experimental groups revealed:

At phase one 7 differences were significant at the .05 level. The student teachers of the experimental group used more praise, less total teacher talk, and placed less emphasis on content than did those of the control group.

At phase two, the student teachers of the control and experimental groups differed from each other on 18 of the 59 variables considered ($\alpha=.05$). The experimental group had less extended student response and student response following student talk, more acceptance of ideas, more teacher talk in area A, more student initiated talk, a higher row 8-9 I/I+D percentage, a higher revised row 8 I/I+D percentage, a higher

revised row 9 I/I+D percentage, less emphasis on content, less extended lecture, and less criticism following student talk.

At phase three, the experimental and control groups were different on 13 variables ($\alpha = .05$). The experimental group exhibited more: acceptance of ideas, teacher talk in area A, questions following student talk, extended acceptance of ideas, indirect response following student initiated talk, and silence following teacher criticism. They had less: lecture, content emphasis, criticism following student talk, extended questions, extended lecture, and silence following student response.

An analysis of the non-random changes experienced by both groups during their student teaching experience yielded the following:

During the first half of student teaching, 13 non-random changes in the experimental group and 2 in the control group were identified as significant at the .05 level. The experimental group decreased in measures of teacher praise used, the amount of student response, tallies falling in area A, and silence following the use of praise. They experienced increases in emphasis on content, measures of student initiated talk, and silence following lecture. The control group decreased in the extended acceptance of ideas and the percentage of tallies falling in area A.

During the second half of student teaching, there were only 6 non-random changes identified in the experimental group and 5 in the control group ($\alpha = .05$). The experimental group experienced decreases in measures of their emphasis on content and use of lecture, and increases in measures of student response and silence following teacher questions. The control group increased their row 8 I/I+D percentage, the percentage of silence following student response, and decreased in three other measures of silence in the classroom.

An analysis of the changes that took place over the entire student teaching experience revealed 10 non-random changes in the experimental group and 4 in the control group ($\alpha = .05$). The experimental group decreased in three measures of praise and in the amount of student response. Other non-random changes over the entire student teaching period revealed increases in student initiated talk and content emphasis in the experimental group.

The control group decreased in silence, teacher talk in area A, and row 8-9 I/I+D percentage, but increased in directions following student talk.

An analysis of non-random changes in relation to the

cooperating teachers detected:

During the first half of student teaching, 4 changes in proximity in the experimental group and 1 in the control group as significant ($\alpha = .05$). All of these changes in the experimental group were toward their cooperating teachers, while the change in the control group was away from their cooperating teachers. These changes in proximity represented moves toward more direct teaching in the experimental group and toward more indirect teaching in the control group.

During the second half of student teaching, only 2 changes in proximity ($\alpha = .05$), both in the experimental group. In each case, the student teachers of the experimental group moved away from their cooperating teachers toward more direct teaching influence.

No proximity changes in the control group over the entire student teaching period, but 5 overall changes in the experimental group ($\alpha = .05$). No patterns could be discerned in the direction of these moves nor in the type of changes in verbal patterns that they represented.

The "Direct Cooperating Teacher" Group

A comparison of teaching patterns between the control and experimental DCT group revealed:

The student teachers of the direct cooperating teacher group began teaching with only 1 difference in their verbal patterns. The experimental group had more silence following acceptance of ideas.

At phase two, the experimental and control groups were significantly different on 12 of the 59 variables considered ($\alpha = .05$). The experimental group revealed a higher row 8-9 I/I+D percentage, revised row 8 I/I+D percentage, and revised row 9 I/I+D percentage than did the control group. They had more extended acceptance of student ideas and silence following acceptance of student ideas. The experimental DCT group was lower than the corresponding control group in measures of teacher lecture, teacher directions, teacher criticism, the amount of student response following student talk, extended student response, and silence following questions and criticism.

At phase three, there were only 2 differences ($\alpha = .05$). The experimental group used less

criticism and had a higher revised row 8 I/I+D percentage than did the control group.

An analysis of the non-random changes experienced by both DCT groups revealed:

During the entire student teaching experience, 4 non-random changes ($\alpha = .05$). The experimental group increased in student initiated talk and in their row 8-9 I/I+D percentage. The control group decreased their use of questions following student talk and increased in silence following student response.

An analysis of non-random changes in relation to the cooperating teachers detected:

Four (4) proximity changes in the DCT group, 3 of which were in the experimental DCT group ($\alpha = .05$). The control group moved toward their cooperating teachers as the amount of silence following teacher questions increased. The experimental group moved away from their cooperating teachers as they decreased in two measures of the use of criticism. They moved toward their cooperating teachers as the percentage of student initiated talk increased.

The "Indirect Cooperating Teacher " group

A comparison of teaching patterns between the control and experimental ICT groups revealed:

The student teachers of the ICT group began teaching with 8 differences in their verbal patterns ($\alpha = .05$). The experimental group was lower in measures of teacher lecture, teacher talk, emphasis on content, and silence following student response. They used more criticism and praise than did the control group.

At phase two, there were 11 differences in their verbal patterns ($\alpha = .05$). The experimental ICT group was lower in measures of lecture, teacher talk, content emphasis, silence following student talk, and silence following teacher directions. They used more criticism, but had higher percentages in student initiated talk, area A, and silence following acceptance of ideas.

At phase three, there were 8 differences in their verbal patterns ($\alpha = .05$). The experimental group was higher on three measures of criticism and on the row 9 I/I+D percentage than was the control group. They had less

lecture and silence following student response and a lower percentage of tallies in the total teacher steady state cells.

An analysis of non-random changes experienced by both ICT groups reveals:

During the entire student teaching experience, 8 non-random changes in verbal patterns ($\alpha = .05$). Of these, 5 were in the control group and 3 were in the experimental group. The experimental group decreased in measures of criticism, and praise following student talk. The control group increased their content emphasis, but decreased in acceptance of ideas, teacher talk in area A, and measures of silence.

An analysis of non-random changes in relation to the cooperating teachers detected:

Six (6) changes in proximity equally divided between the control and experimental groups ($\alpha = .05$). The experimental group moved toward their cooperating teachers in three measures of criticism as they decreased in each. The control group moved away from their cooperating teachers on two measures of the use of directions as they decreased the use of each. These moves, however, represented an initial move toward their

cooperating teachers in the decreased use of directions followed by a further decrease in their use which caused the group to move beyond their cooperating teachers and away from them.

Discussion

Introduction

Limitations imposed by the inability to sample randomly the two groups from a larger population are inherent in this study. Nevertheless, the comparisons to be drawn, while certainly not conclusive, can provide insight into the nature of the effect of the cooperating teacher and indicate directions for further research.

The Entire Sample

The student teachers of the experimental group began their student teaching using more indirect verbal influence than did those in the control group, as indicated by the seven differences between the groups.

During the first half of student teaching, the experimental group experienced 13 non-random changes while the control group experienced only two. It appears that those in the experimental group were "trying" different patterns of teaching with a greater sense of direction than were those in the control group. One might expect that the

experimental group would have become more indirect, but, in fact, both groups experienced changes that were toward more direct teaching influence--with the exception of an increase in student initiated talk in the experimental group.

While both groups moved toward more direct teacher influence during the first half of student teaching, a comparison of the teaching patterns at phase two reveals that the control group became more direct than did the experimental group. At phase two, the student teachers of the control and experimental groups differed from each other on 18 of the 59 variables considered. With the exception of two measures of student response, these differences are all indicative of a more indirect experimental group.

During the second half of student teaching, there were only 6 non-random changes identified in the experimental group and 5 in the control group. These changes in the experimental group were all toward more indirect teacher influence. The control group experienced one change that was indicative of more indirect teacher influence. With this exception, the changes were in measures of silence in the classroom which, by themselves, are difficult to interpret. Thus, the experimental group moved toward more indirect teaching during the second half,

while the control group was less definitive in its changes.

If one looks at the entire period of student teaching (phase one to phase three), it can be seen that both groups moved toward more direct teaching influence, but the experimental group also experienced moves toward more indirect teaching. The control group did not. These changes resulted in a more indirect experimental group, as indicated by a comparison of teaching patterns at phase three.

At phase three, the experimental and control groups were different on 13 variables. All of these indicated less emphasis on teacher control in the experimental group and, in general, a use of more indirect verbal influence.

A study of non-random changes in relation to their cooperating teachers detected only 4 changes in proximity in the experimental group and 1 in the control group during the first half of student teaching. All of the changes in the experimental group were toward their cooperating teachers, while the change in the control group was away from their cooperating teachers. These changes represented moves toward more direct teaching in the experimental group and toward more indirect teaching in the control group.

The second half of student teaching showed only 2

changes in proximity, both in the experimental group. In each case, the student teachers of the experimental group moved away from their cooperating teachers toward more direct teaching influence.

There were no proximity changes in the control group over the entire student teaching period, but there were 5 overall changes in the experimental group. No patterns could be discerned in the direction of these moves nor in the type of changes in verbal patterns that they represented.

Perhaps the most readily apparent difference encountered in the two groups was the number of changes detected. The experimental group experienced far more total non-random changes (29) than did the control group (11). Changes with respect to their cooperating teachers were also more numerous (11 in the experimental group compared with only 1 in the control group). This apparent increased tendency to change could mean that those student teachers with training in interaction analysis are more sensitive to the teaching patterns of others, as well as their own, and tend to experiment more freely with different patterns. This hypothesis is supported by the fact that the changes in proximity were far more numerous in the experimental group but failed to indicate a directional tendency. If it is desirable to encourage experimentation

on the part of student teachers, it would seem that training in interaction analysis might be worthy of further consideration.

Two questions arise immediately concerning these results. First, the experimental group began teaching in a more indirect manner than did the control group. It is possible that they may have continued to become more indirect without training in interaction analysis-- i.e., the results may be due to sample bias. Second, the number of differences between the experimental group and the control group peaked at the middle of the student teaching experience and decreased toward the end. If these observations could have been extended into their teaching career, perhaps one would have found that, after a time, there was little or no difference between the two groups. If the effect is present, but only short lived, the value of the training is questionable. These questions and others of a similar nature can only be answered by further duplication and extensions of the present work.

The " Direct Cooperating Teacher " group

The student teachers of the experimental DCT group began their student teaching with only one difference, and this only in a measure of silence in the classroom.

During the entire student teaching period, there were only 4 non-random changes identified. The overall changes were toward more direct teacher influence in the control group and toward more indirect influence in the experimental group.

A comparison of the scores at each phase indicates that the control and experimental DCT groups, while initially very similar, experienced changes that resulted in their becoming quite different at phase two, but again very similar at phase three (1, 12, and 2 differences at phase one, two, and three, respectively). These differences at phase two and three would indicate a more indirect experimental group.

There were 4 proximity changes in the DCT group, three of which were in the experimental group. There were no apparent relationships between the indirect-direct aspects of their changes and their increases or decreases in proximity.

Although the changes in proximity do not indicate excessive cooperating teacher influence in the direct group, the tendency of the experimental and control groups to become quite dissimilar near the middle of their student teaching, and yet to exhibit only 2 differences at the end of student teaching, raises some questions. This tendency to become more alike near the end of

student teaching, although present in all phases of the analysis, is more pronounced in the direct cooperating teacher group. More research is needed to explore the possible reasons for this.

The "Indirect Cooperating Teacher" group

The student teachers of the experimental ICT group began their student teaching with 8 differences in their verbal patterns. With the exception of a greater use of criticism, the experimental ICT group began their student teaching using more indirect teacher influence than the control group. During the entire student teaching experience, 8 non-random changes in verbal patterns were identified. Of these, 5 were in the control group and 3 in the experimental group. The changes in the control group were toward a busier classroom atmosphere and more direct teacher influence, while the changes experienced by the experimental group were not as clearly defined.

A comparison of the scores at each phase shows that the control and experimental ICT groups remained fairly constant in the number of differences in their verbal patterns (8, 11, and 8 differences at phase one, two, and three, respectively). At all three phases, the experimental group appears more indirect than the control

group with the exception of a greater use of criticism which was present each time. It is questionable whether the experimental group was more indirect at phase three than at phase one. The number of differences was the same and the nature of the differences was very similar.

There were 6 changes in proximity equally divided between the control and the experimental groups. All changes in proximity in the indirect cooperating teacher group were toward their cooperating teachers during both halves of the student teaching period, or toward during the first half followed by a move away during the second half. There were two such moves away during the second half of student teaching, both in the control group. They represented, however, continued decreases in the use of directions, which caused the control group initially to move toward their cooperating teachers and then to move beyond them in a more limited use of teacher directions. All moves in both groups were toward more indirect teacher influence. Thus, both groups appeared to be influenced by their cooperating teachers in this ICT group.

Conclusions

The conclusions stated are limited to the population of secondary science student teachers at Cornell University

from 1963-1966, and to the variables defined in this study, and are based on the results of the entire sample only. Within the limitations of this study, the investigator concludes that:

1. The most rapid period of change in verbal behavior occurs during the first half of student teaching for those student teachers trained in interaction analysis, and during the second half for those not so trained.
2. After the first half of student teaching, both those student teachers trained in interaction analysis and those not so trained experience changes that decrease the number of differences between them.

The investigator also concludes that secondary science student teachers, who have been trained in interaction analysis, differ significantly from a control group not so trained, in the following respects:

1. They experience more non-random changes in their verbal patterns.
2. They experience more non-random changes toward indirect teacher influence.
3. They experience fewer non-random changes toward direct teacher influence.
4. They use more indirect teacher influence.

5. They are more likely to change their verbal patterns in relation to those of their co-operating teachers.

Implications for Further Research

The findings of this study point to the need for further research in several areas. The following list contains those findings that the author feels are especially pertinent.

1. In view of the apparent decreases from phase two to phase three in the number of differences between those trained in interaction analysis and those not so trained, there is a need to follow-up the student teachers of studies such as this into their teaching careers. It is possible that the effects noted in this study are only short-range.
2. Variations in the training of interaction analysis should be studied for different effects. In particular, these variations should include:
 - (a) more extensive instruction in interaction analysis.

- (b) different approaches to the instructional technique itself.
 - (c) instruction in other systems of analysis of teaching behavior.
3. Research is needed on the effect of training the cooperating teachers in interaction analysis, in addition to, and also instead of, training the student teachers in the technique.
 4. The unusual fluctuations in the number of differences between the control and experimental groups in the DCT and ICT groups, and the tendency for student teachers to move toward their cooperating teachers in the ICT group, indicate a real need to study student teachers assigned to cooperating teachers who represent "extremes" on various criteria.
 5. Observational systems, such as the one developed by Parakh (1965), must be developed and perfected to meet the special needs of science teaching. A very important (at least we think it is important) part of science teaching was omitted from this study because of an inability to describe

adequately the laboratory portion of the science classrooms.

6. Finally, one very interesting implication of this research concerns the apparent change in behavior ("learning") brought about by the training in interaction analysis --the training that the student teachers neither liked, nor valued. This training was accomplished using a rather direct approach (unintentionally). Since the results of this study confirmed, where applicable, the findings of others who have reported that the student teachers placed high value on the training received, it raises serious questions concerning the cherished notion that the way we teach is as important as what we teach. It seems, to the author, that giving this type of training to student teachers, with subsequent observation, provides a very nice method of investigating these questions. Research is needed in which the results of those who placed high value on the training would be compared with the results of those who placed little value on it.

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There are 67 references listed in the final report.